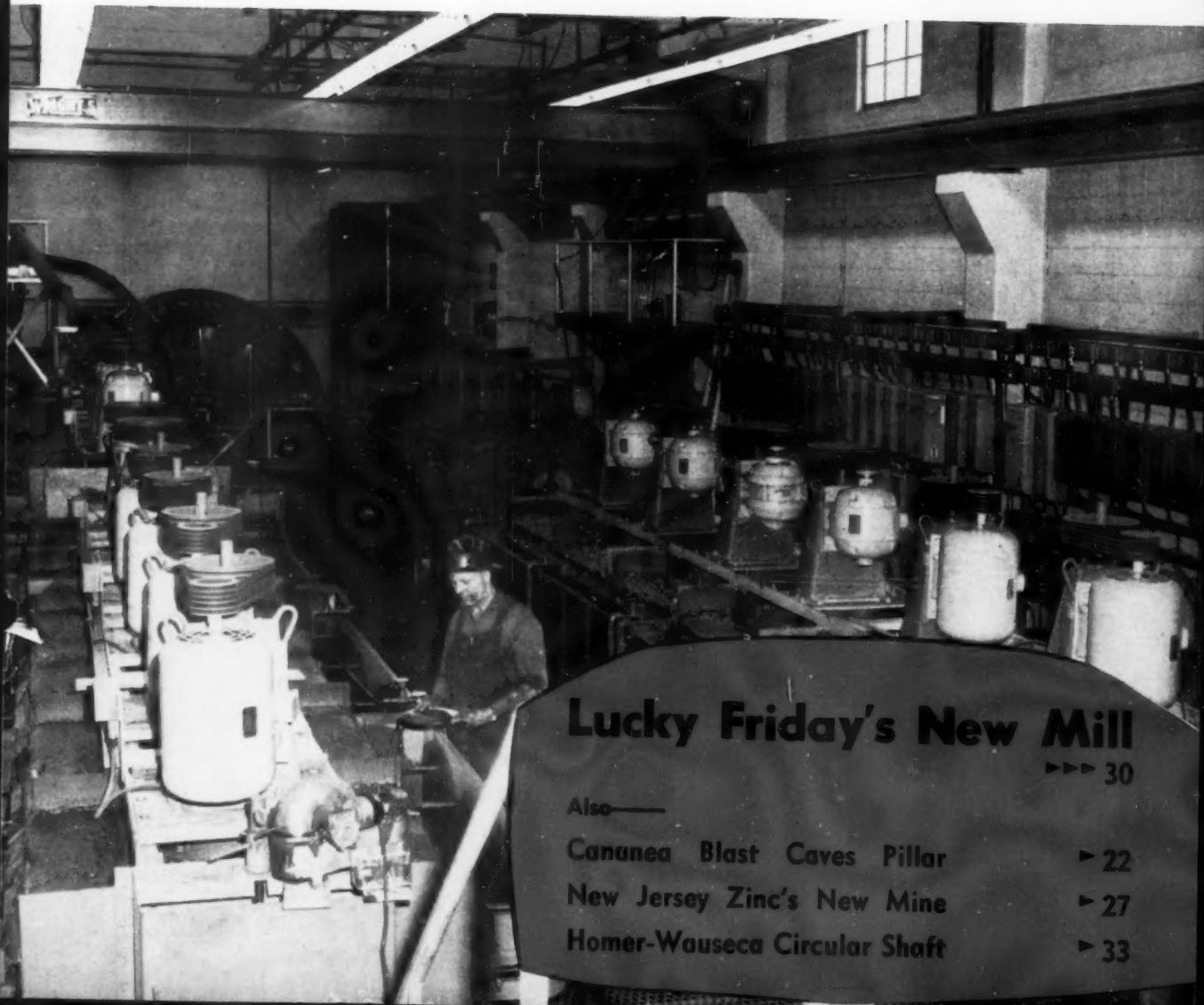


MINING WORLD



APRIL
1960



Lucky Friday's New Mill

►►► 30

Also—

Cananea Blast Caves Pillar
New Jersey Zinc's New Mine
Homer-Wauseca Circular Shaft

► 22

► 27

► 33



"Imagination... is the source of human improvement; experience its implement"



Steep Rock Iron Mines, Ltd.

FUTURE IN IRON: MODERN PLANTS TO SATISFY GIANT, NEW DEMANDS

Iron is still king. More than ever, it is the world's most-used, most-needed metal.

And today the key to meeting increased demands for iron is *mineral engineering*, the imaginative use of technology, processes, methods and equipment to increase output while keeping costs in line.

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WKE services in these projects include feasibility studies, design and construction of pilot facilities as well as large-capacity production plants.

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Building for the Future—in a World of Industries





Specify
SANDVIK
COROMANT
ROPE-THREAD
bits and steels

...for quick hand uncoupling!

No, it's not child's play, but the fact is you can uncouple Sandvik Coromant Rope-Thread bits and steels by hand! Smooth, shallow-depth, rounded threads with a pitch of just 2 turns per inch prevent binding. You'll have fewer thread failures too, compared with "saw-tooth" thread designs. What's more, only the threads are hardened, so you can re-thread steel sections without heat-treating. And, with faster uncoupling, you'll drill more feet per shift!

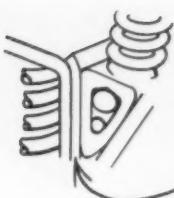
Coromant bits and steels have many other advantages, too: Better quality carbide (Sandvik is one of the largest manufacturers of carbide in the world)... better, more rigid steel...superior workmanship... all add up to above-average bit and rod life, up to double the footage between sharpenings, and straighter, cleaner holes.

Want proof? Easy! Call us and we'll arrange for a demonstration and test on your job. Write us today. Address: Dept. MW-11.

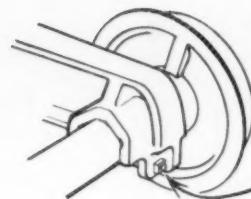
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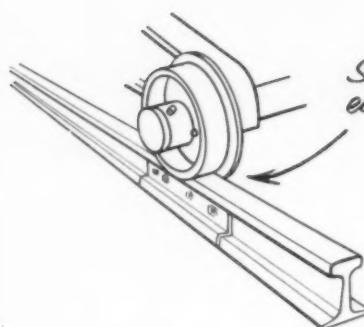
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Movement between bolster and side frame is taken on specially designed wear surfaces



Quick wheel change



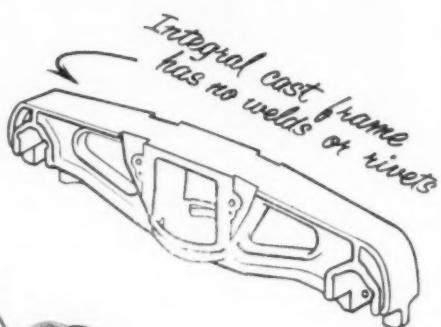
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V-shaped machined axle grips for controlled flexibility and truck alignment



Integral cast frame has no welds or rivets

Check these "plus" features

OF
NATIONAL
NC-1 TRUCKS

If you're considering the purchase of new 8-wheel mine cars . . . or if you're thinking of modernizing older cars—now is the time to check the advantages

of National NC-1 Trucks. National NC-1 Trucks have controlled flexibility for track variations yet still maintain truck alignment through their machined V-shaped axle grips. In addition, NC-1 Trucks have a built-in shock absorbing mechanism.

You get more out of your mine car investment per workshift . . . per day . . . per year. And at the same time you minimize spillage . . . get greater protection for your equipment, track and structures . . . slash maintenance to a new low.

Yes, now is the time to check National NC-1 Trucks—they make sense for 8-wheel mine cars . . . make dollars for operators, too.

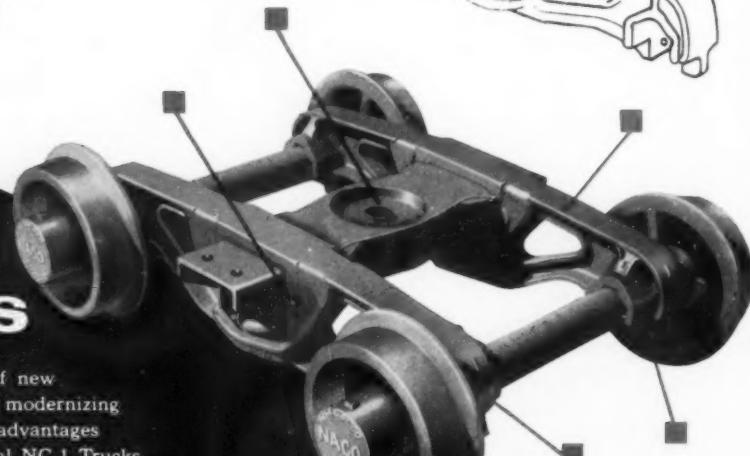
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NC-1 CAR TRUCKS • NACO STEEL WHEELS

NACO STEEL LINKS & SWIVEL HITCHINGS

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NATIONAL MALLEABLE and STEEL CASTINGS COMPANY

Established 1868

Cleveland 6, Ohio

VOL. 22 NO. 4

April 1960

Three New Milling projects get underway in United States. Mills for copper in Arizona, magnetizing iron roasting in Minnesota, and lead-zinc in Colorado are all in construction stage 21

King Size Blast caves pillar fringe area at Cananea Copper in Mexico. The shot contained 131.8 tons of high explosive in 4,198 diamond drill holes, 1,553 percussion drill holes, one churn drill hole, and four coyote holes to break 8,000,000 tons 22

Wyoming's Trona Trend sees leasing and drill activity north-south of Westvaco, Sweetwater County 26

New Jersey Zinc's new zinc mine, the Flat Gap, in eastern Tennessee is first mine in new major district. Ore has unusual minerals for district and is a new structural type for district 27

Lucky Friday's New Mill is small in size for 500-ton unit. It makes a high recovery of lead and zinc with only two operators per shift. Flowsheet incorporates two stage crushing, ball mill-cyclone grinding, and differential flotation 30

New Continuous recording instrument has been developed to survey small diameter drill holes. Union Corporation, Limited of South Africa asks that you write for details .. 32

Circular Shaft at M. A. Hanna Company's Homer-Wauseca mine at Iron River, Michigan was sunk with two deck stage and an Eimco 630 for mucking 33

WHAT'S GOING ON IN MINING

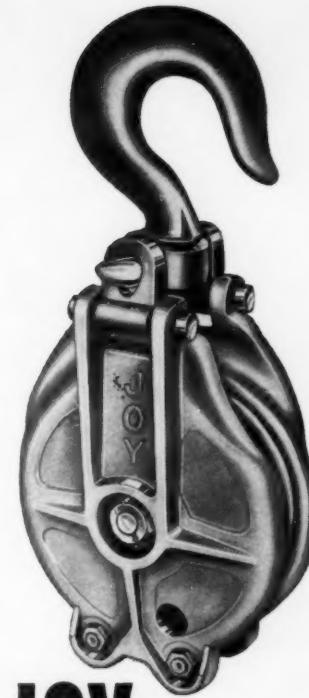
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MILLER FREEMAN PUBLICATIONS



JOY quick opening
SHEAVE BLOCKS

forged construction

The hook and side plates of the 6", 8" and 10" sizes are forged alloy steel. The wheel is chrome-nickel-moly cast steel. All parts are heat-treated for strength and wear resistance.

simple & rugged

There are no pins, chains, bolts or nuts to handle or remove. TO OPEN JUST TURN AND PUSH . . . no parts leave the block to become lost. The rugged opening mechanism will last for the life of the block.

Write for Bulletin 287-8

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Joy Manufacturing Company
Oliver Building, Pittsburgh 22, Pa.

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MIGHTY... HEALTHY... POWER

Whether your choice is the 225-hp HD-21 or the 150-hp HD-16, you get from 8½% to 27% more efficient engine operation than from other crawlers.

This fuel-pinching efficiency is a fact! Your Allis-Chalmers dealer will show you actual proof of up to 27% fuel savings in the Allis-Chalmers 16000 or 21000 engines over units of comparable size. He'll tell you why they run cleaner, "sip" fuel to earn the title "industry's healthiest engines."

Six crater-shaped pistons develop 225 hp in the HD-21, 150 hp in the HD-16 . . . both at an easy 1825 rpm. Coupled with torque converter drive they provide plenty of rough dozing lugability . . . all the power you'll ever need.

These big Allis-Chalmers tractors are built for mighty tough service. Shock-absorbing all-steel main frame, durable double-reduction final drives, certified permanent lubrication of tapered roller bearing truck wheels, idlers and rollers, and extra tough track keep them going season after season with a minimum of maintenance. Your Allis-Chalmers construction machinery dealer will be glad to show you an HD-21 or HD-16 soon. Allis-Chalmers, Construction Machinery Division, Milwaukee 1, Wisconsin.

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MINING WORLD



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DRIFTS AND CROSSCUTS

South America 1960

Watch for *Mining World's* big special report on mining activity in South America in May.

A barnstorming President and two new copper projects that will contribute 240,000 tons annually to the world supply have served to focus attention on South America. But this is by no means the total story.

Mining is on the move in South America. Engineering surveys are under way covering potential new copper mine developments and new copper smelters. The continent is experiencing an "Iron Rush," and news of iron ore developments threatens to take the play away from copper. Hematite, magnetite and itabirite reserves are present in simply incredible quantities.

By 1974 alumina refining and smelting facilities will be installed at the bauxite sources of some of the companies operating in The Guianas. Another large scale manganese project will reach completion, start production this year.

Small wonder that we gain the impression that South America is throbbing with mining activity. Every major mining company in the world has field exploration parties criss-crossing the continent and making examinations. There is a complete international flavor to all this activity, too. It's apparent that the English, the Dutch, the Germans, the French, the Canadians and, yes, the Americans and many others are planning new developments. Nor are all opportunities limited to the huge-multi-million dollar investment class. We'll have a short report of small and medium-size opportunities that also exist.

The special May issue will contain important announcements and disclosures of interest to everyone with a stake in mining.

Thanks Union Corp.

The mining world thanks the Union Corporation, Limited and its officers for their interest in the entire mining industry in releasing information on the new electronic drill hole surveying instrument for the benefit of the industry.

So important has been the offer of cooperation to all companies, that prospect from surface by drilling, that the entire letter outlining use of the new instrument has been duplicated on page 32.

Every mining company has the opportunity to use this instrument. Every mining company has the opportunity to use the pages of MINING WORLD to report advances in technology to the industry. The words of M. W. Richards, Union Corporation director, are repeated here for emphasis.

"This instrument has been developed by officials of this Corporation, but because of its possible value to all companies concerned with drilling operations we think it preferable to publicize this information and to make it freely available rather than to patent it. We should be happy to assist any of your readers wishing to develop this device for their own use."



BLASTING IS OUT— D9 AND RIPPER IN— PRODUCTION

UP 35%

Gillen Coal Mining, Inc., is salvaging a six-ft.-thick seam of coal near Carbondale, Pa. To get to the coal, 180 ft. of overburden must be removed—10 ft. of topsoil, 100 ft. of hardpan and, finally, 70 ft. of rock.

Gillen used to blast through. Then they changed to a Caterpillar D9 Series E Tractor with a No. 9 Ripper. Production shot up 35%. Cost savings are estimated to be 60%!

The overburden, rough as it is to work with, is the kind of material the D9 and No. 9 Ripper eat up. Working in 50-ft. passes, the team fragments the hardpan (average cu. yd. weight 3200 lb.) into right-size pieces for two Cat DW21s. They're moving up to 4000 yd. a seven-hour shift. When needed, the D9 pushloads the scrapers and 'dozes, too.

The D9 and No. 9 is an all-business combination of power and speed. The Series E Model D9 has a 335 HP (flywheel) turbocharged engine to put massive power into the work. You get more power from every gallon of fuel. The Series E D9 has a heavier undercarriage. Track components are bigger, heavier. You get up to 40% more

life with deeper hardened steel shoes, links and rollers. A new equalizer bar makes the Series E D9 even more stable.

New power shift transmission gives you the flexibility and anti-stall features of a torque converter with the split-second snap of direct drive. Finger-tip control gives operators instant changes under full load without clutching.

Match this with the No. 9 Ripper to break your way through production bottlenecks. For the right tractor-ripper combination, see your Caterpillar Dealer, who will prove his recommendation with a demonstration.

Caterpillar Tractor Co., General Offices, Peoria, Ill., U.S.A.

CATERPILLAR

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WANTED—
THE HARD WORK

CAPITOL concentrates

GOVERNMENT ACTION AND REACTION AFFECTING MINING



Domestic Copper Miners, Attention! . . .

Those concerned with the future of the copper industry in the United States will be greatly interested in press dispatches from Chile, relating to the recent visit of President Eisenhower and his efforts to create good will in the Latin American countries.

Among the many things that the President is reported to have promised in Chile is that he will "study the possibility of eliminating the import tax on copper—Chile's major export." This is a subject which domestic miners are going to watch mighty carefully.

We not alone give the foreign countries huge loans to build their own industries, but we make special inducements for financing in foreign countries industries which are directly competitive with those in the United States. And now the President is going to "study the possibility" of giving the jobs of those employed in United States mines to Chilean workers.

The present copper tariff is but 1.7 cents per pound having been cut by Presidential edict from 4.0 cents to 2.0 cents and then to 1.7 cents. It is

but a fraction of what is needed to place United States mines, with their high wage scales and rail transportation, on an equitable competitive basis with Chilean mines, with their low wages and water transportation. Maybe some United States copper miners will be willing to have a three-day work week in order to give Chilean workers full-time jobs—but we doubt it.

The Presidential promise, according to press dispatches, "may come back to plague him, but, for the time being, it is being cited in Chile as evidence of his interest in Chile." ■

Tariff Commission Rejects Fluorspar Case . . .

The flat turndown the domestic fluorspar industry received from the United States Tariff Commission on February 29, 1960, was accompanied by an announcement in the press which indicates that the Canadian fluorspar industry is planning for substantial expansion.

The Senate Finance Committee on August 21, 1959, had instructed the

Tariff Commission to make a report, under Section 332 of the Tariff Act, to the Congress and recommend by what means the domestic industry could be saved. The Tariff Commission, being an arm of the Congress, this seemed a sensible thing to do. Three out of five members of the commission, however, refused to accede to the Finance Committee's resolution, thus in effect defy-

ing the Congress. Senator James E. Murray of Montana was so disturbed at the Tariff Commission's position that he openly threatened to try and have the commission's budget cut.

The lead-zinc case, put before the commission on a similar resolution, was due for a report on March 31. Observers comment that the commission in all probability will make a decision similar to that in the fluorspar case. ■

Repeal Of Silver Transaction Tax Endorsed . . .

MINING WORLD has commented a number of times upon the desirability of repealing the 50 percent Silver Transactions tax. This tax brings in no revenue, but resulted in removing the silver bullion market from New York to London and made it impossible to speculate in silver on the American commodity market.

Many New York banking houses

have, at one time or another, advocated that the tax be repealed so as to bring back silver trading to this country. The latest advocate is Bache & Company. In a recent publication, in which the repeal of the tax is featured, this conservative financial house says: "This discriminatory tax remains in force to the detriment of producers, consumers, refiners and distributors.

. . . We urge you to write your Congressman to initiate legislation to repeal the transfer tax on silver profits."

This matter has been debated by the silver bloc in the Congress for many years. The reason why no action has been taken is that should such a measure come to the Floor of either house, the anti-silverites might use it as a medium, by means of amendments, to repeal the entire Silver Purchase Act. ■

Secretary Seaton Reaffirms His Position . . .

In the face of strong pressure by Canada, Australia, Peru, and Mexico exerted through the State Department,

Secretary of the Interior Seaton has reaffirmed his previous statements (as of February 9, 1960) that the Admin-

istration has no present intention of revoking the quotas on lead and zinc. He further said that in his opinion the quota will not have its full effect upon prices for some time. ■

Office Minerals Exploration Appropriation Is Cut . . .

Although the President requested \$1,100,000 for the Office of Minerals Exploration, the House Appropriations

Committee only provided half that amount. The explanation given was that loans in the first half of this fiscal

year amounted to only a little over \$100,000. For administration \$150,000 was allowed, or more than one-third of the total available for loans. OME operates with minimum budget.

MORE CORE - LESS COST



**TRUCO DIAMOND DRILL BITS
USED THROUGHOUT
THE MINING WORLD**

**WHEEL TRUEING
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of CANADA, LTD.**

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JOY HAS THE RIGHT SLUSHER FOR THE JOB



Model No.	Horsepower
S-211	5 hp
FF-211 & FF-311	7½, 10, 15 hp
A2F-211 & A2F-311	15, 20, 25 hp
B2F-211 & B2F-311	20, 25, 30, 40 hp
C2F-211A & C2F-311A	50, 60, 75 hp
R-221 & R-222	100, 125 hp
RF-211-212	100, 125 hp
XT-221 & XT-222	150 hp

With a complete line of job-rated slushers, Joy can recommend the proper unit to do the job efficiently. For true economy on the small jobs, Joy offers the S-211 and FF-211 line in sizes from 5 to 15 horsepower. These units are air or electric driven and extremely compact for portability underground.

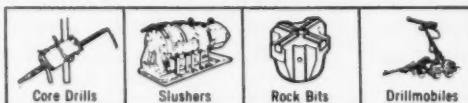
For medium capacity, Joy builds A and B class slushers from 15 to 40 hp. These two and three drum slushers are designed to handle the bulk of scraping jobs.

Three larger units in the "C" series go up to 75 hp for the heavy-duty jobs where portability is still required. For the largest semi-permanent installations, Joy builds large capacity slushers from 100 to 150 horsepower.

With more than 300 types and sizes of hoists and slushers to choose from, there is not a scraping job that can't be handled most efficiently with a Joy unit. Call in a Joy engineer for the size and type to suit your scraping jobs or write for bulletin 950-8.



EQUIPMENT FOR MINING...FOR ALL INDUSTRY



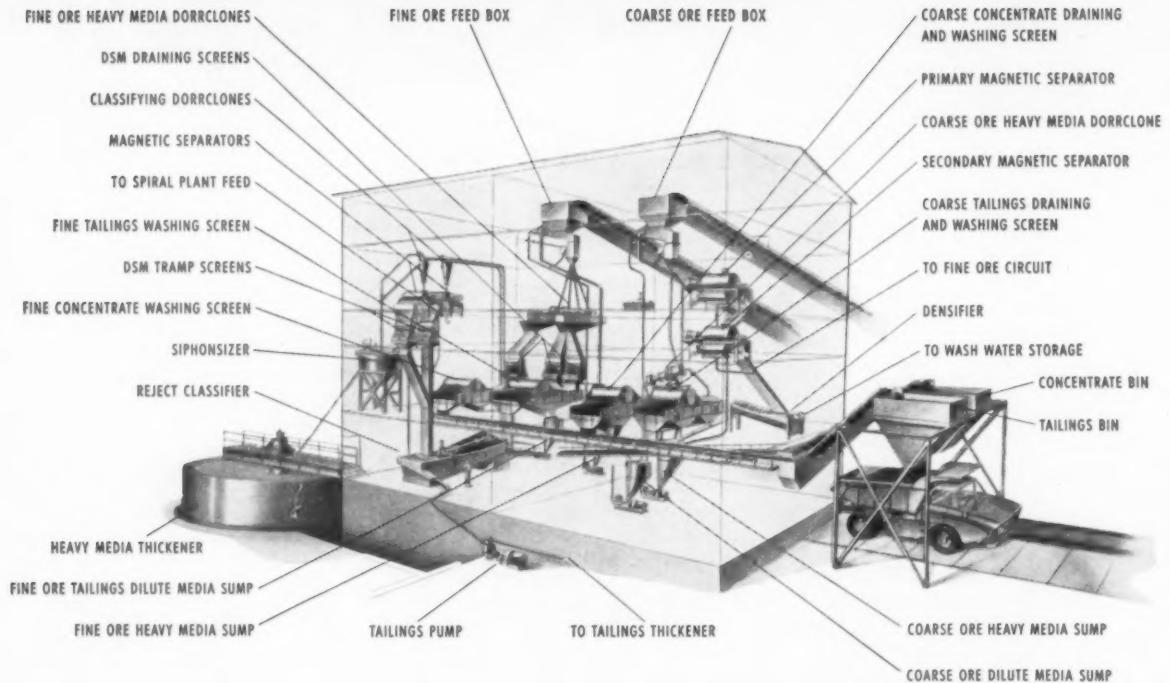
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*a major advance
in ore
beneficiation...*

THE DORR-OLIVER



HEAVY MEDIA PROCESS

For the beneficiation of mineral ores . . . metallic and non-metallic, the Dorr-Oliver Heavy Media Process represents one of the most significant advances over conventional methods for ore beneficiation since the basic application of the sink-float process.

Embodying, and emphasizing, compact high volume components, the D-O process stresses improved metallurgy. Media loss can be reduced as much as 80 percent. Illustrative of this, and heart of the process is the DorrClone® as a separatory vessel and the Dorr-Oliver DSM® Screen for feed preparation, medium draining and tramp service. Application of the DorrClone extends the size range of ore handled by the cyclone heavy media process to minus 2½" by plus 65 mesh. The marked superiority of the DSM Screen for high capacity wet screening of material in the 8 to 100 mesh range has been proven in numerous fields of application.

Whether contemplating new plant construction, conversion of existing facilities or the exploration of new fields of application, the improved flowsheet of the Dorr-Oliver Heavy Media Process warrants investigation. For complete information write for a copy of bulletin 7110. Dorr-Oliver Incorporated, Stamford, Connecticut.



Disinfectants, Cleaners, Detergents

Pamak fatty acids are used in such products as a replacement for oleic acid or other fatty acids. They react with alkalies more readily than do oils or fats, to give soaps. Products compounded from Pamak soaps are clear, stable, and of uniform color and viscosity. Pamak is used in preparing liquid soaps and cleaners, gelled cleaning soap, and industrial cleaners.

Pamak fatty acids react with alkylolamines to form condensates suitable for use in detergent mixtures or as emulsifiers for various purposes.¹ Ethylene oxide reacts with Pamak fatty acids to form detergents.

Flotation

Pamak is used in the beneficiation of metallic oxide ores and nonmetallic ores sufficient froth so that added frothers are not necessary. It is used as received, saponified to a soap, emulsified, or may be thinned for ease of feeding by blending with light fuel oil. Pamak is used in alkaline circuits or alkali may be added to form its soap. Extremely effective, from 0.5 to 1.0 lbs. of Pamak per ton of ore is usually adequate.

Pamak 4 and Pamak 15 are the grades most commonly used for flotation. Pamak is useful in beneficiation of these minerals:

Ilmenite
Kyanite
Fluorspar
Spodumene
Hematite
Phosphate rock
Barite
Cement rock

Manganese Ore

Floor Coverings

Pamak fatty acids may be partially esterified and used to replace linseed oil in linoleum cement, the binder for inlaid linoleum. The lower cost and stability of price of Pamak versus linseed oil make Pamak attractive. Pamak fatty acids are used for fiber wetting and lubrication in the manufacture of vinyl-asbestos floor tile.

H. L. Sanders, "Fatty Acid Alkylolamides," *Journal of the American Oil Chemists' Society*, Vol. 35, No. 10, pp. 549-551, 1958.

16

OOPS—WE GOOFED PAMAK® IS IDEAL FOR MANGANESE ORE, TOO



We can't even blame it on a copyreader, but when we printed our new booklet on Pamak, Hercules fatty acids from tall oil, we unintentionally omitted manganese ore from the list of materials where Pamak is exceptionally useful as a flotation agent. But we have *not* omitted our thorough research and technical service, and the high quality that

consistently marks our product. If you already have your copy of this booklet, we hope you'll remember that manganese belongs. If you haven't received a copy, you'll certainly want one for your files. A postcard to Hercules will bring you your copy.

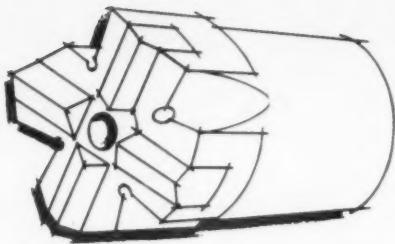
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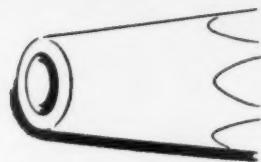


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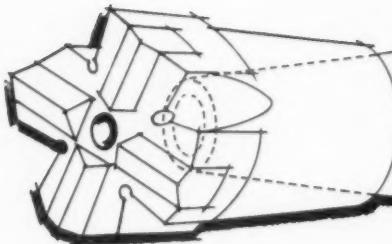
MINING WORLD



Removable



yet



one-piece strong

Improved air-leg bit cuts your drilling costs 4 ways!

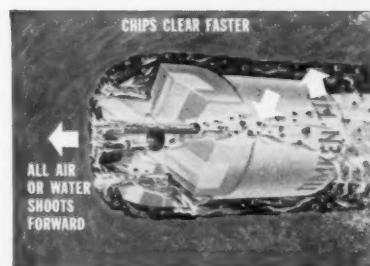
IT'S *removable* to save time and money — yet the new Timken® tapered socket bit for air leg drills has *one-piece strength*. The union is tapered! Now, for the first time, you can get the strength of one-piece bits plus these five cost-cutting advantages of removability that intraset steels can't give you:

1. No need to throw away good drill steel when the carbides wear out. With intrasets you have to waste perfectly good steels.
2. A pocketful of bits is enough for a day's work. You haul an armful of steel with intrasets.
3. You can change bit gauge sizes fast on the same steel. Using intrasets you have to change the whole steel.
4. You carry only the bit to the shop for resharpening—when it's a Timken removable bit. With intrasets you "fight" the whole steel and Timken bits give longer gauge wear because there are *four* carbide cutting edges.

Most intrasets have only two.

Notice at right how the new frontal design of the Timken tapered bit clears chips faster for extra savings. And new, special-analysis carbide inserts give superior wear-resistance, added shock-resistance. They can be reconditioned many times.

Get *all* these savings. Switch to the new Timken tapered bit. For free brochure write: The Timken Roller Bearing Company, Rock Bit Division, Canton 6, Ohio. Cable address: "TIMROSCO". Makers of Tapered Roller Bearings, Fine Alloy Steel and Removable Rock Bits.



CHIPS CLEAR FASTER because 1) five front holes shoot water or air directly against the rock face and 2) deeper, wider wing clearance lets chips wash back faster.

TIMKEN®
removable rock bits

"We particularly like the snappy action and control accuracy of the TD-25's front-mounted winch," report the Walls Brothers, Wolf Ridge Coal Co. Their "25" has a key job, helping strip 35-ft. earth, shale and sand rock overburden from a 4-ft. seam of coal.

"THIS NEW TD-25 REALLY HAS IT for overburden stripping"



C. M. and Reid Walls,

"We have had eight years of fine service using International TD-24's," report the Walls Brothers, for Wolf Ridge Coal Company. "Our faster and easier starting new TD-25 really has it for mountain overburden stripping operations.

"The '25's' turbocharged diesel engine governs instantly to load increases, giving the power to carry full blade loads right on through without lug-down. The TD-24's, and now the TD-25 have proved to us that the live power-turning feature moves more overburden, and gives top operating safety."

Of all king-sized crawlers, only the new 230-hp International TD-25 has Planet Power-steering. This



Another duty of the TD-25—shattering coal with the two-standard Ateco ripper to size the coal and speed load-out. "We've used International TD-24's since '51 with continuous operation, good service, minimum repairs," add the Walls Brothers.



Wolf Ridge Coal Co., Oliver Springs, Tennessee

is the only planetary system engineered and located to give you the dual advantages of "live track" power-steering; plus on-the-go, Hi-Lo power-shifting that does away with steering clutches.

Planet Power-steering eliminates load-limiting "dead-track drag"—gives you full-load pull-power on turns as well as straightaways. And Hi-Lo power-shifting does away with time-wasting "gear-shift lag"—gives on-the-go matching of power to load, for full-speed cycles.

Rip-snorting turbocharged power

Press the direct-start button, to command the "25's"

rip-snorting, free-breathing diesel horsepower! Dual valving of the "25's" high-torque DT-817 engine provides for peak turbocharging efficiency—to deliver full-rated performance from sea level to timberline!

Prove what it means in bonus capacity to get the double-barreled advantages of power-steering and power-shifting—in a finger-tip-controlled crawler with DT-817 diesel wallop! Measure the extra value of getting years-proved Planet Power-steering (along with Hi-Lo power-shifting) as designed-in, built-in basic standard equipment. Compare performance—see what's behind TD-25 ability to outearn king-sized clutch-steered crawlers up to 50% on overburden removal, land-clearing, high-walling and other tough mine and quarry jobs. Let your International Construction Equipment Distributor demonstrate!



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5

Big Advantages of EUCLID'S TC-12

Twin-Power Crawler

Functional "years ahead" design, combined with unequalled power, makes the new series TC-12 the best all-around performer in the big tractor field. Its big power and big performance helps beat the pinch on profits...on every kind of big tractor work. Check these cost-cutting features:

Twin Engines with a total of 425 net horsepower... separate Torqmatic Drives each consisting of torque converter and semi-automatic transmission...more workability for heavy dozing, ripping, push-loading and towing than any other "super" tractor.

Independent Track Drives give the big TC-12 almost unbelievable mobility and maneuverability. With its separate power train and Torqmatic Drive, each track can work all the time because its power and speed is individually controlled. Operator has immediate, positive control for quick turns and side slope work.

Rigid Track Alignment is constantly maintained because each track is positioned to its main frame...each half of the tractor oscillates on a big diameter transverse shaft which provides maximum traction in rough going and increases track life. The tractor can be easily split into two halves for transport from one job to another.

Fast, Easy Operation is achieved by the separate Torqmatic Drives and simple controls. There's no master

clutch...changes from one speed range to another are made under full power. Excellent visibility front and rear, and comfortable operator's seat, help to increase productive capacity. Good machine balance and stability, and "fast on its feet" performance, make the TC-12 unequalled for any big tractor work.

Service Accessibility that cuts downtime to a minimum is a feature of TC-12 design. Unitized assembly of converter, transmission and drive case components permits fast servicing or replacement without major tear-down of other parts. For example, both drive sprockets can be removed or replaced in about one-third the time required for the same work on a competitive big tractor. Planetary final drives can be serviced without breaking track or pulling sprocket.

Whatever the job, if it's a big tractor application the Euclid TC-12 will bring the best return on investment... the Euclid dealer in your territory can prove it!

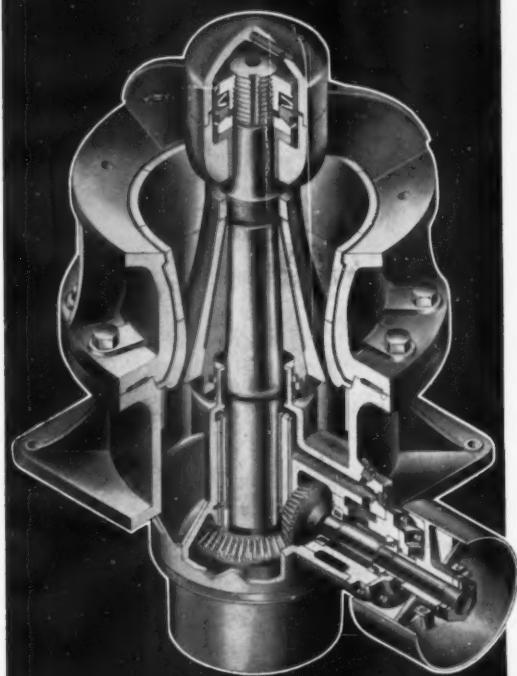
EUCLID Division of General Motors, Cleveland 17, Ohio



EUCLID EQUIPMENT

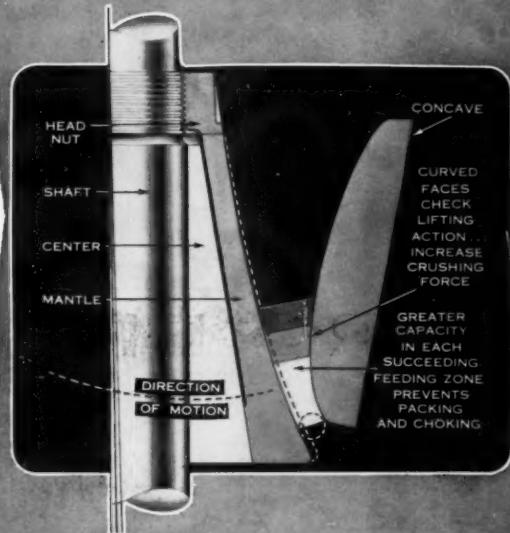
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EXPLOSIVES AND MINING CHEMICALS DEPARTMENT

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About HOMESTAKE metallurgy

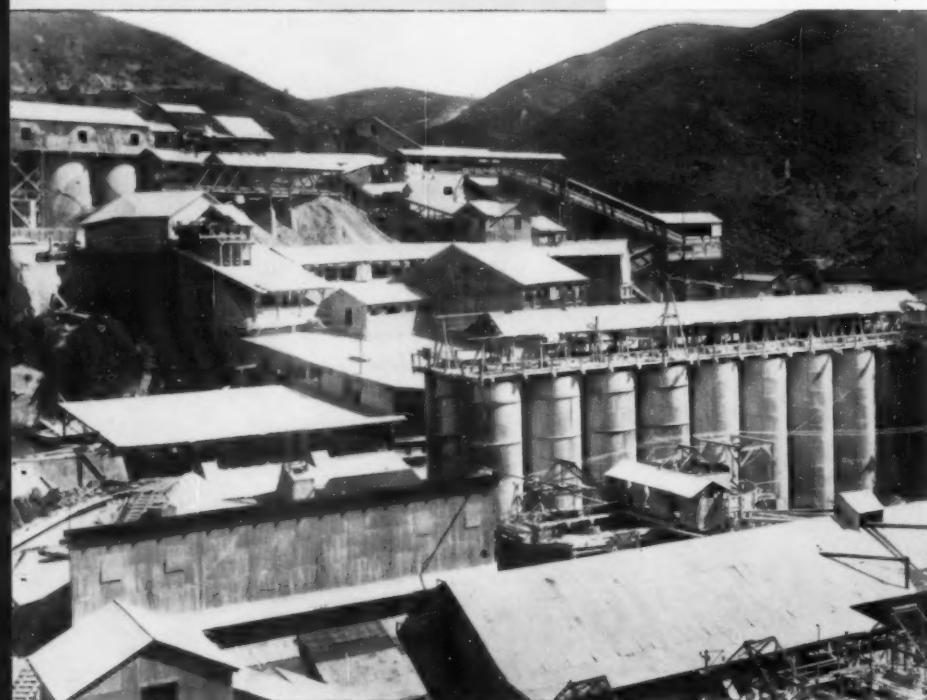
Since 1878 Homestake has treated some 85,600,000 tons of ore yielding upwards of 23,000,000 ounces of gold valued at more than \$800,000,000 at the current Mint price. Homestake is a brilliant example of continuous study and change of both mining and milling techniques to offset rising costs.

Originally a stamp mill-amalgamation operation, Homestake pioneered the use of cyanidation soon after the turn of the century through the original work of C. W. Merrill. While the complex geologic structure and distribution of the ore was deciphered over the years, metallurgy, too, has been steadily improved.

Homestake recovers 71.5% of values from 4750 t.p.d. by amalgamation after wet grinding through 80 mesh. Sand and slime fractions, about 55% and 45% respectively, are separated by bowl classifiers and cyclones, and treated separately.

Sands with heads averaging 0.115 oz./ton are batch leached with AERO Brand Cyanide solution. Consumption is 0.42 lb./ton NaCN equivalent. Residues average 0.012 oz. and 17% of total head values are recovered in this step. Slimes at 0.070 oz./ton are cyanidated in a separate plant with AERO Brand Cyanide solution. Consumption is 0.30 lb./ton NaCN equivalent. Slime residues average 0.006 oz. Values recovered from slimes are 8.5% of total head values in the ore.

Since ore treated assays 0.333 oz. and combined residues average less than 0.010 oz./ton, overall recovery exceeds 97%. Cyanide consumption is 0.35 to 0.40 lb. NaCN equivalent and lime consumption only 2.4 lb. per ton.



The REAL DEL MONTE story

Worked continuously since the days of Moctezuma, Real del Monte is probably the world's oldest major silver producer. Here the Patio Process was conceived by a Pachuca miner in 1557 and used until supplanted by cyanidation in the early 1900's.

Today Real del Monte treats ore from several deposits; 1400 t.p.d. by cyanidation alone, 1000 t.p.d. by flotation. Ore averaging 253 gm. Ag, 1.26 gm. Au per metric ton and low in base metals goes directly to cyanidation. This ore is ground in an AERO Brand Cyanide solution, maintained at a solution strength of 1.30 kilos NaCN equivalent per metric ton. Overall plant recovery of silver is 83.0% with cyanide consumption of 0.65 kilos NaCN equivalent per metric ton.

Base-metal ore containing precious-metal values is concentrated with Cyanamid flotation reagents. Pb, Zn and Fe concentrates are produced. Tails are cycloned and the 550 t.p.d. underflow is pumped to the cyanide grinding section for treatment with the cyanide feed. Zinc concentrates, cyanided separately, assay 5.0 kilos Ag per metric ton prior to cyanidation; 300 gm. Ag after treatment.

Real del Monte is an excellent example of a very old property that has continuously improved its metallurgy as new ore bodies have been opened and discarded tailings from earlier generations have been reworked with modern beneficiation methods.



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*Packages of Economical Power

	B-125	G-149	G-226
Displacement, Cu. In.	125.2	149	226
Horsepower (gasoline)	28.3 @ 1900 rpm	45 @ 2000 rpm	67 @ 1800 rpm

Fuels: Gasoline, kerosene, distillate, and natural gas, plus LPG for the G-149 and G-226. Also diesel engines are in various models up to 516 h.p.

POWER-CRATER is an Allis-Chalmers trademark.

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POWER FOR A GROWING WORLD



Three New Milling Projects Underway

1. ASARCO Breaks Ground For 15,000 Ton Mission Copper Mill

Construction work started March 1st on the 15,000-ton-per-day copper flotation concentrator at American Smelting and Refining Company's Mission Project near Tucson, Arizona. The new plant will be erected by Western-Knapp Engineering Company of San Francisco, California under terms of the contract awarded last September. Cost of the concentrator is estimated at \$17,000,000, and completion is scheduled for September 1961.

On hand at the "Opening Date" ceremony were T. A. Snedden, general manager of ASARCO's southwestern mining department; R. B. Meen, general superintendent of the

Mission plant; W. R. Mahoney, construction engineer for ASARCO; and C. H. Scheick, assistant director of engineering for ASARCO. Western-Knapp was represented by Robert Engle, and E. R. Davidson.

ASARCO started stripping of the major copper deposit last year using scrapers. By year's end, 1,654,650 tons of partially cemented gravel and wash had been hauled to waste dumps around the pit area. With the recent delivery of large electric shovels ASARCO is now stripping with shovels and Euclid Diesel trucks. The recently started light blasting ahead of the shovel speeds loading and minimizes dipper teeth wear.

Mr. Scheick has been in San Francisco since last September, working with Western-Knapp on design phases of the project. He also will supervise the construction phase. E. M. Nicholson will serve as WKE's construction superintendent.

The mill will be one of the most efficient of its kind, incorporating the newest metallurgical techniques, and employing many automatic measuring and control devices. It is estimated that the plant will mill 5,400,000 tons of ore annually, producing approximately 45,000 tons of copper each year. Norman Weiss, ASARCO's milling engineer is supervising all design and construction.

2. U.S. Steel and Hanna Pilot Plants For Magnetic Roasting

Two leading iron ore producers will build pilot plants on the Mesabi Iron Range to experiment in production of iron ore concentrate from semi-taconite. The process to be used by both M. A. Hanna Company and the Oliver Division of United States Steel Company will be that of magnetizing roasting to reduce hematite to magne-

titite for magnetic recovery.

The Hanna plant near Cooley, to cost nearly \$2,000,000, will have a capacity of about 10 tons of iron ore an hour, while U. S. Steel's similar facility at Coleraine will be geared to five tons an hour. The process used at the latter will involve use of propane, but other fuels may also be

used.

Semi-taconite, a low-grade iron bearing material has had no commercial use. It is much softer than regular taconite and, thus, easier to mine and crush. Because it is non-magnetic, however, it cannot be concentrated by the same processes used for the magnetic taconite.

3. Camp Bird Builds New Lead-Zinc Flotation Mill in Colorado



Camp Bird Colorado, Inc., operator of the famous Camp Bird mine in Ouray County, Colorado is building a new 500-ton-per-day lead-zinc flotation mill. With engineering work completed by Western-Knapp Engineering Company of San Francisco, California actual construction is scheduled to start by company crews in mid-April, weather permitting. The schedule calls for completion in September.

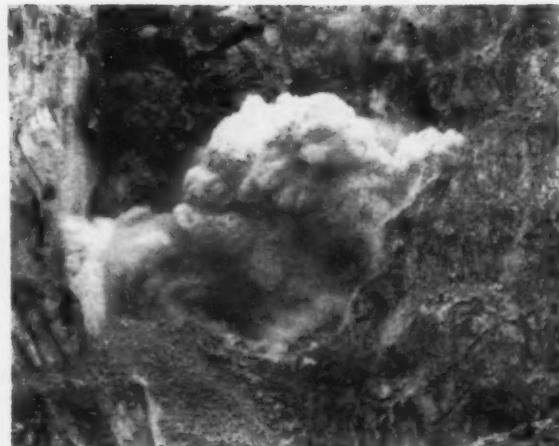
Lead-zinc-copper sulphide ore with gold and silver values will be mined from the Pierson and Camp Bird veins and hauled out the long drain tunnel to the portal, shown in picture, where the new steel and concrete crushing and mill buildings will be built. This

is the exact location of the old stamp mill originally built in the early 1900's which was burned last year.

Two-stage crushing-jaw and Symons—will be followed by two-stage grinding-ball and rod mill—ahead of flotation. The Denver ball mill will be operated in closed circuit with a Krebs cyclone; underflow to a Denver mineral jig for coarse gold recovery. Lead will be cleaned once to make about a 65 percent concentrate, and zinc twice to produce a 58 percent zinc concentrate. These concentrates will be loaded into trucks and hauled to railroad for shipment to American Smelting and Refining Company's smelters.



1. Block of ore is stopped to maximum safe limits . . .



2. Then blasted to hole through to the surface . . .

KING-SIZE BLAST caves pillar

To avoid the hazard of long, unsupported roof spans over working areas, Cananea Consolidated Copper Company fired one of the largest underground blasts for the extraction of ore in the history of mining. This blast, called "Kaputt", was fired December 15, 1957. The shot contained 131.8 tons of high explosive and was used to break 8,000,000 tons of rock. The area blasted had 4,198 diamond drill holes, 1,553 percussion-drill holes, one churn drill hole and four small coyote holes.

Approximately 1,500,000 tons of 0.75 percent copper ore and 6,500,000 tons of mixed ore and waste were broken. Since the blast, 1,500,000 tons of ore have been extracted from the area. About 1,000,000 tons of ore still remain to be reclaimed. A higher extraction rate could have been attained but production schedules for the open-pit and for the underground mine had to be coordinated.

Formerly Cananea mines were developed in high grade

copper ore bodies and worked on a smaller scale than they are today. In 1944, a 12,000 ton-per-day flotation concentrator was completed which helped make possible profitable mining of large low-grade ore bodies.

When the grade of the ore at Cananea was over three percent copper, square-set, cut-and-fill, top-slice, shrinkage, and open-stope methods of mining were used. Later, to mine lower grade ore, the stoping system was changed to a modified sub-level stoping method.

Large open stopes 80 feet wide, 400 feet long, and 270 feet high now allow low-cost, large-tonnage extraction. The modified sub-level stoping system, however, does not permit the degree of selective mining possible with earlier stoping methods.

Moderately small-scale stope blasting is optimum for sub-level stoping if safety permits. The ground at Cananea stands well during regular stoping. As mining progresses,



5. Most blastholes were put in with diamond drills



6. Tamping weight was used for higher powder factor



3. Breaking 8,000,000 tons . . .



4. For recovery at underground drawpoints where boulders are blockholed

and fringe area ore for drawpoint recovery

however, the openings reach such large dimensions and expose such large areas of unsupported back that roof falls could become a hazard if larger areas of open back were to be exposed. For this reason it was decided to blast the pillars and the remaining stope ore in one large blast.

This system offered the advantage of complete extraction of ore without danger to personnel. At no time was there any danger from an air blast since the stopes were open to the surface on one end. Thus the air which might have been compressed by a roof fall would have been dissipated to the atmosphere. The system is well adapted to final pillar recovery and fringe area extraction of ore. Today large-scale blasts have become common practice in the mines of Cananea to remove pillars after conventional stoping has been completed or nearly completed.

The North Area of the mine which was prepared for the blast contained two excavated stopes each measuring

By A. W. Ruff and J. R. Velasco

80-by 270-by 400 feet. To blast the entire area at one time, it was necessary to develop a large drilling area on the fringe sides of the stopes and also to undercut the area to as great an extent as possible without causing the roof to cave prematurely.

The 2-55 stope block was confined on three sides (see diagrams), and only because there were very small undercut pillars and an abnormally large undercut area was it possible to break the 120-foot burden with one blast. Very little pillar crushing was noted in the undercut level prior to the time of blasting.

Mr. Ruff is assistant mine superintendent and Mr. Velasco is chief geologist at Cananea Consolidated Copper Company

The Cost In Time, Labor and Materials For The Blast

Powder

		Pounds	Tons
Diamond-drill Holes:	80% Special Gelatin	247,600	123.8
Percussion-drill Holes:	80% " "	6,000	3.0
Churn-Drill Hole:	60% Quarry "	5,000	2.5
Coyote Tunnel	60% "	5,000	2.5
Total		263,600	131.8

Calculated Using Tonnage of Drilled Ore Only

Tons Per Foot of Drill Hole:	3.0
Tons Per Pound of Powder:	5.8
Pounds of Powder Per Ton:	0.17
Cubic Yard (in place) Per Pound of Powder:	2.7
Pounds of Powder Per Cubic Yard (in place):	0.38

Drilling Data

Number of EX Diamond-drill Holes:

Back 1,136

Floor 3,025

Total 4,161

Back 14

Floor 23

Total 37

Back 80,250

Floor 418,534

Total 498,784

Back 1,258

Floor 3,697

Total 4,955

Average length of diamond drill holes

120 feet

Powder

Number of Feet of Primacord		255,246 feet or 48 miles			
		Minimax	Electric-Delay	Blasting Caps Used	
Delay	Quantity	Delay	Quantity	Delay	Quantity
1	1,160	5	187	9	89
2	1,016	6	85	10	225
3	741	7	94	Total	4,048
4	254	8	197		

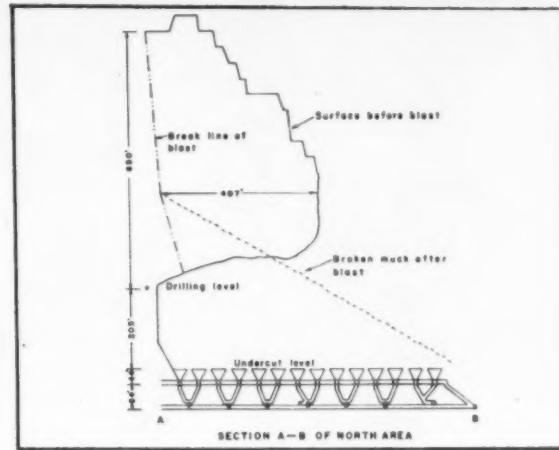
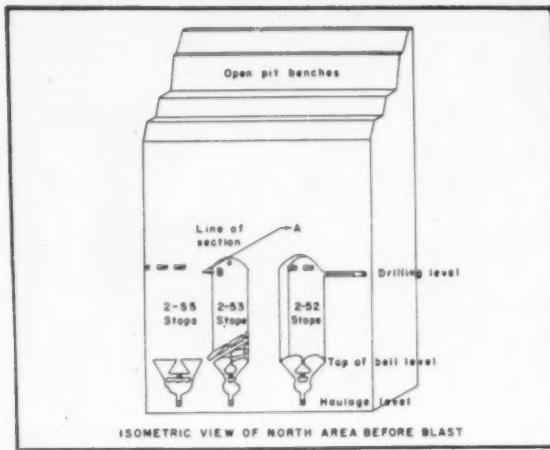
Labor

Man Shifts to Cut Drilling Rooms:	1,225
Man Shifts to Cut Undercut:	1,973
Man Shifts to Drill Round:	9,975
Man Shifts to Load Round:	1,352
Man Shifts to Connect Round:	70
Total	14,595

Power Requirements

Primary Voltage:	2,300 Volts
Secondary Voltage:	220 Volts
Three 2,300 to 220 Volt Transformers	
Three Reverse Series-in-Parallel Circuits	
Thirty Caps Per Series.	

Diagrams illustrate blasting problem, show how the round was



On the northeast side of the 2-55 stope, an abutment had been left to provide safe support during previous mining. The abutment could not be conveniently diamond drilled for the blast so an inclined coyote raise was driven from the top of a belled drawpoint. Four coyote chambers were driven from the raise. The coyote chambers aided greatly in removing the rock abutment from the end of the stope. The powder charges in the chambers were connected with Primacord, and four 400 millisecond-delay Minimax electric caps were connected to the Primacord. The 400-millisecond delay was the longest timing used; therefore, the coyote chambers were the last to explode.

The pillars in the undercut area were drilled and the holes loaded with explosive. The loaded holes in each pillar were connected with Primacord, and a 35 millisecond-delay cap was taped to the Primacord. Since the 35 millisecond-delay was the shortest timing cap, the undercut pillars were blasted first.

Previously, it was found that if there were long blasting delay intervals between closely spaced holes, misfires would sometimes occur. The misfires occurred when the first hole to explode broke the rock sufficiently to cut off later-delay holes below the cap. Primacord does not prevent this type of misfire because the Primacord can

also be cut.

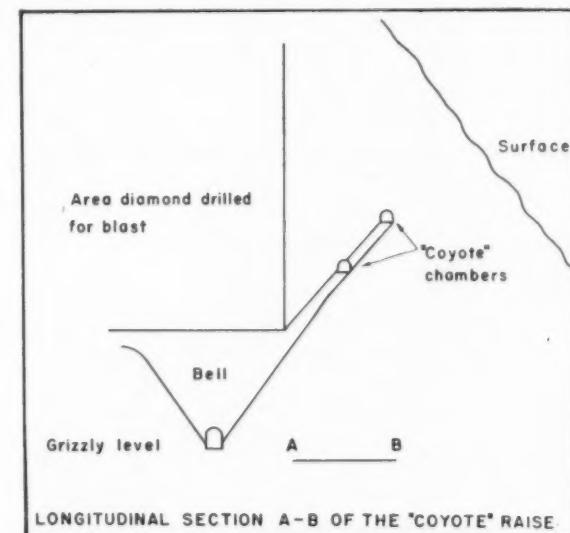
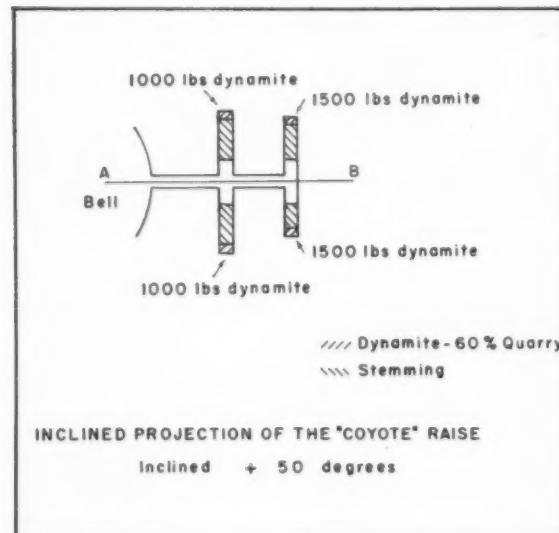
The method which was used to prevent this type of cut-off was to place caps with 60-foot leg wires about 45 feet inside the blast holes and to use only a few short-delay periods. On the 2-55 side of the blast where there was a long open face, four delay periods were used. Primacord was used only on the 2-55 side of the blast where there was a possibility of rock movement before the area was ready to blast.

The average length of the diamond-drill holes was 120 feet, and the average length of the percussion-drill holes was 6 feet.

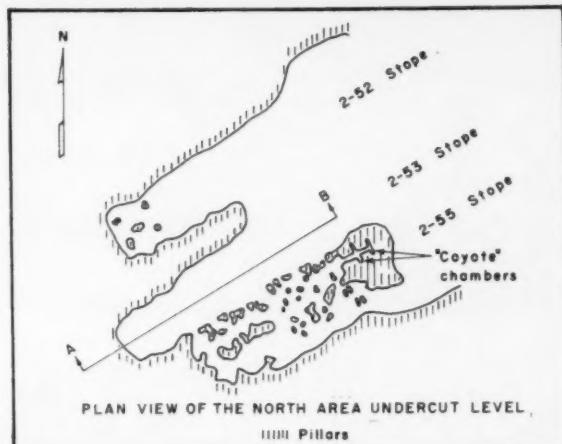
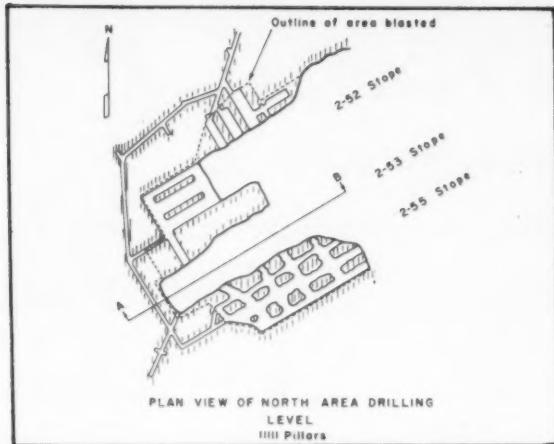
The large burden (120 feet) of the 2-55 stope broke well for several reasons. One reason was that the long face prevented strong confining stresses except at the very ends of the stope. Also, after each delay was fired, there was enough rock movement to allow the seismic waves from later delays to be reflected at the fractures caused by the earlier delays. This continued the slabbing and breaking action.

The blasting caps were fired with 220-volt alternating current and with reverse series-in-parallel circuits. Each series contained from 28 to 32 caps.

General mine safety precautions were observed



timed, how coyote holes were placed, and how wiring was done



throughout the work. In addition, the following extra precautions were taken:

- 1.-Level readings were periodically taken on the surface over the area.
- 2.-Observations were taken, with a microseismophone, of the microseismic noises in the pillars.
- 3.-Strain gauges were cemented to the rock in various locations to provide readings from which rock stress could be calculated.

A comparison of the secondary-breakage costs before and after the blast is shown. The increase in the secondary-breakage cost after the blast probably resulted from an increase in the size of the boulders encountered in the draw holes. Since a large proportion of the rock broken had never been drilled, an increase in the secondary-breakage cost was naturally predicted. The increased cost was easily afforded because a large volume of ore was caved for past, present and future draw from the area. This ore did not incur either drilling or blasting expenses. The blasting parameters used for the project appear to be economically equivalent to the blasting parameters used for the smaller stope blasts in Cananea.

About 50 percent of the draw points have been stopped since the blast because the grade of ore at these points

has dropped below 0.60 per cent copper. During extraction a rough draw control kept the draw areas from channeling waste into the surrounding belled raises. No powder was found in the ore drawn from the North Area which indicates that there were no misfires.

Acknowledgements

Certain photographs were taken by Mr. M. H. Taylor, Safety Engineer, Cananea Consolidated Copper Company. All the other photographs were taken by the senior author, Mr. Ruff.

The authors wish to thank Messrs. R. S. Newlin, President, Greene Cananea Copper Company; Albert Mendelsohn, Retired General Manager; and C. P. Donohoe, General Manager, Cananea Consolidated Copper Company, for their helpful criticisms and for permission to publish the paper.

Thanks should also be given Mr. R. A. Sheldon, General Mine Superintendent, for his interest in the paper.

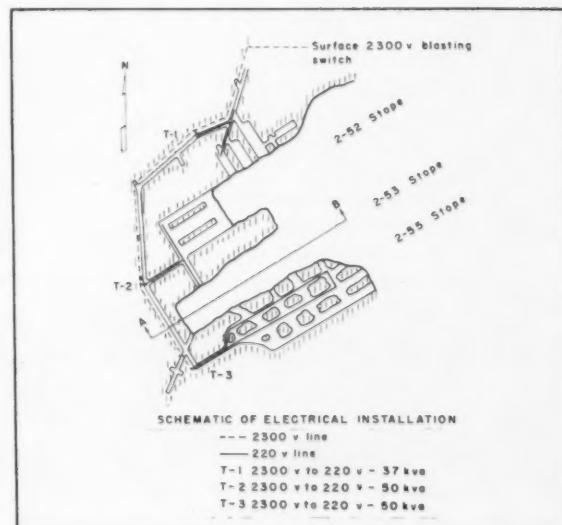
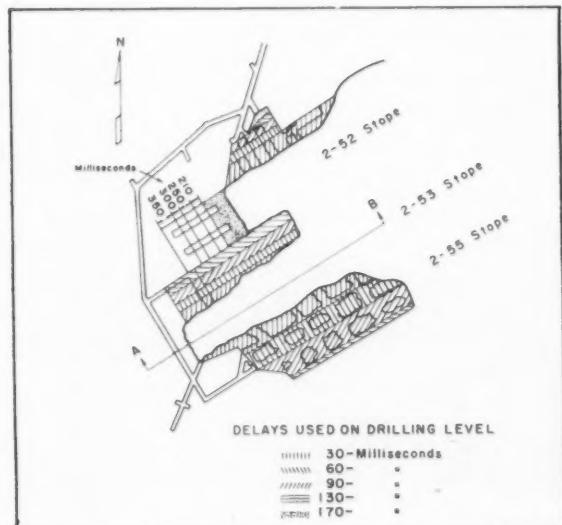
Bibliography

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Secondary Blasting Cost Per Ton Before and After Blast

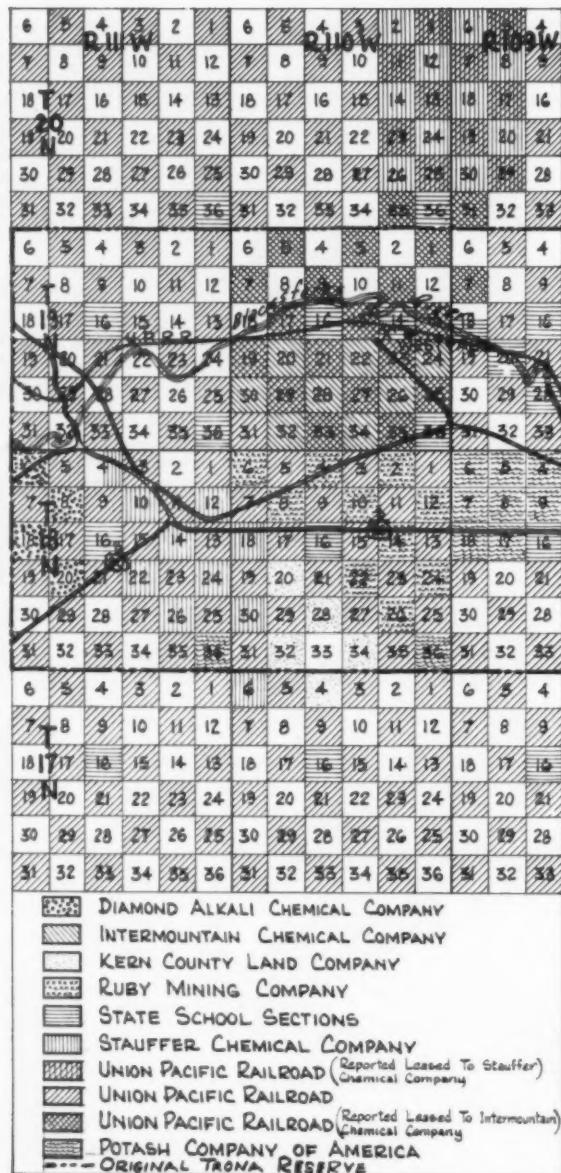
Time Interval	Labor	Material	Total
12 Month Interval Prior to Blast	\$0.05*	\$0.05**	\$0.10
20 Month Interval After Blast	\$0.056*	\$0.052**	\$0.108

*Adjusted for wage increase
**Not adjusted for price increase



Wyoming's Trona Trend...

active leasing and drilling north-south
of Westvaco, Sweetwater County
by several mining and chemical companies



TRONA LEASE MAP. Not drawn to scale. North at top.

A major campaign of land leasing and surface drilling has been under way along Wyoming's Trona Trend for more than a year.

The existence of a mineable deposit of trona has been known since 1938 when it was recognized in the core from a dry exploration hole for oil. The Union Pacific Railroad and the Intermountain Chemical Company blocked out several hundreds of millions of tons of ore by drilling in the early 1940's. Development started in 1946 with the sinking of a 1,500-foot-deep shaft at what is now called Westvaco and is so marked on map. Actual mining started in 1947 and has continued to date.

Trona, sodium sesquicarbonate, ($\text{Na}_2\text{HCO}_3 \cdot \text{NaHCO}_3 \cdot \text{H}_2\text{O}$) is found in several beds of which the lower averages 10 feet thick in the Green River formation. The beds, essentially horizontal, are overlain by several hundreds of feet of thin bedded shale. Oil shale, about 20 feet thick, underlies the ore. In many places the upper two feet of ore are so interbedded with shale that selective mining has been practiced at Westvaco for grade control.

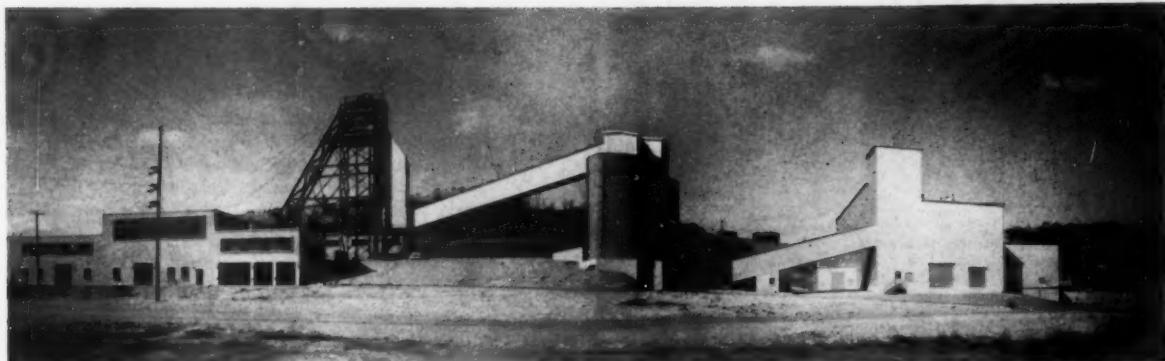
The main trona bed, first mined by Westvaco, and all the other upper beds are believed to be the result of the evaporation of an ancient saline lake which left practically no sodium chloride (salt) which is the most common constituent of an evaporated saline lake.

Recent drilling apparently has indicated a series of lensing beds with at least two main beds. Apparently the upper bed thins slowly to the south and then turns to salt. Stauffer Chemical has reportedly found mineable ore in the upper bed to the north. In several of the leased areas there is the distinct possibility of two mineable beds. Geologists believe the center of the ancient lake was to the south with less salt in the deeper portion to account for less salt in lower trona bed. This means that it could be commercial further south than the upper.

In addition to the companies interested in the area shown on the map, it is reported that Utah Construction and Mining Company has started surface drilling on several tens of thousands of acres to the north of Westvaco.

It is believed that Stauffer Chemical has advanced further than any of the new companies. However, a problem of surface damage to the Seedskadee Irrigation District might result from underground mining on some of Stauffer's holdings.

The accompanying map has been compiled from data available to MINING WORLD from many sources and is intended to show the extent of trona interest together with locations of land which has been reported leased to the companies as listed during the year. It is believed that the map is one of the most accurate printed to date, but it must be understood that changes can take place on a daily basis which could make this map obsolete, even before it's printed.



MODERN SURFACE PLANT includes offices, dry and change room, headframe, ore storage bins, and 2,000 ton per day

flotation mill. The entire plant was patterned after the company's Jefferson City mine at Jefferson City.

New Jersey's New Zinc Mine . . .

**Flat Gap's the first mine
In a new district in Tennessee
A new suite of minerals are found
In a new structural type ore body for area**

The new mine of the New Jersey Zinc Company is at Treadway, 22 miles north of Morristown. Heretofore, the eastern Tennessee zinc district has centered between Mascot and Jefferson City in Jefferson County. The new Copper Ridge, or Treadway-Idol district is some 45 miles to the northeast.

Geological mapping and geochemical prospecting started on Copper Ridge May 30th 1950; diamond drilling at Treadway started in 1951 with

12 drills soon operating. Geochemistry proved to be a helpful tool in the exploration. Careful mapping, however, previously had disclosed that ore did crop out in one place in an area of less than 10 square feet.

On September 11, 1955, shaft sinking was started; in August 1957, the hoisting shaft, the service incline and the 2,000-ton-per-day flotation mill were completed.

It was unfortunate that this project neared completion at the time when

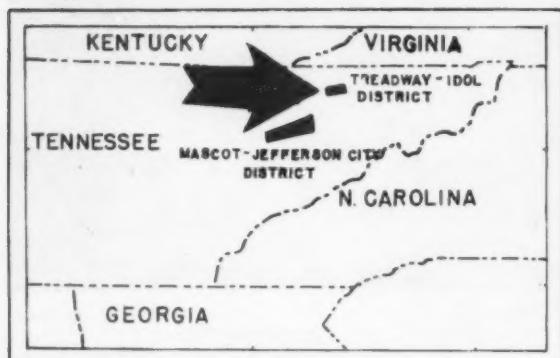
the zinc market was in a depressed period, and it was found necessary to curtail development work during this time. Some improvement in demand and price for zinc enabled the start of production on January 4, 1959, and by year's end output reached 2,000 tons of ore per day. While the mine is operating it still has to look forward to the return of economic conditions in the zinc market that prevailed at the time the decision was made to undertake development.



EFFICIENT MATERIALS handling is a feature of the surface plant. The concrete block U-shaped building houses the mine

repair shops, warehouse, hoist room, mine office, dry and change rooms. The shaft is sunk in the center of the U.

Structural Control Important at Flat Gap for Localization of Ore in the Kingsport



EASTERN TENNESSEE now has two zinc districts as shown on map. First production from Treadway Ridge was in 1959.

While the new district—Copper Ridge, named after the snake (*Agkistrodon Mokasen*) rather than for copper minerals—is new and different from Mascot-Jefferson City in many ways, the most important identical feature is that mineralization in both is found in the Kingsport member of the Knox dolomite of Ordovician age. The Kingsport is an interbedded dark and light gray dolomite with numerous chert and sandy zones. Main ore horizons are in the lower two-thirds of this 290 to 350-foot-thick formation.

At Flat Gap, the beds dip 37° southeast and strike northeasterly. At Jefferson City, the beds dip only 7°, with ore-thicknesses varying from nine to almost 100 feet. Here, the ore bodies have very strong stratigraphic control.

At Flat Gap, the ore body appears to have more structural than stratigraphic control as the ore zone crosses the bedding and dips steeply to the southeast. Thus, there is a massive block of ore conforming in strike over a length of several hundreds of feet and with widths up to 100 feet cutting sharply across the bedding. Ore is mined to assay

Planned Room and Pillar Mining Method With Stopes Developed Across Full Ore Width

The Flat Gap ore body is developed through an inclined shaft and a seven-compartment vertical shaft. The vertical man hoisting and supply shaft

sunk into the foot wall is 880 feet deep with mining levels at 350- and 500-foot depth. Knowing that the ore body was large and could be mechanized for high tonnage mining, simultaneously with the sinking of the vertical shaft a 15 by 15-foot incline was sunk 5,000 feet at minus-10-percent to the 500 level. This incline is used primarily as a means of getting Dumptors, jumbos, Transloaders, and shovels in and out of the mine without disassembly. The incline affords a second entrance to the mine and also serves as an air way.

Mining is by a planned system of room and pillars with 30-foot-diameter, round pillars and 60-foot-wide stopes. Stoping consists of two main operations: the driving of main headings and the slabbing and benching of these headings to increase the width and height of stopes.

Here's how the mine has been developed. From the 350-foot shaft level, a cross-cut was driven to the ore body where it connected with the bottom of the long incline. The incline reached the shaft from the northeast so a footwall drive was turned southwest off the crosscut in ore but along the footwall. This 16-by 16-foot heading was driven at a plus-10-percent slope. From the footwall incline, every 150 feet, a level crosscut was driven across the full width of the ore to the hanging wall. Once this main heading had been driven away from shaft and crosscuts established, stoping started by slabbing crosscuts and establishing pillars according to plan.

The next step is to establish more

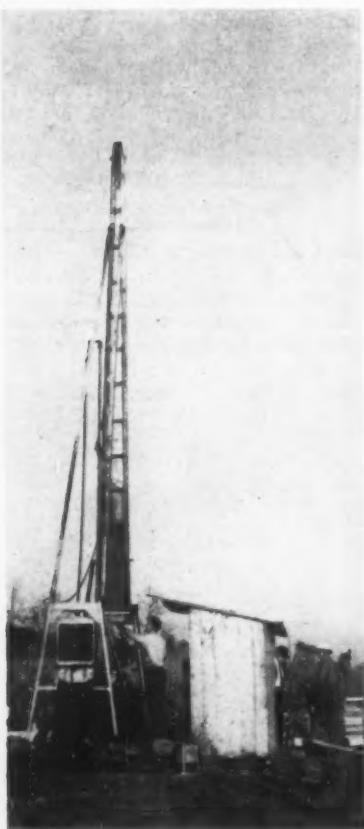
working faces and increase the height of the stope. This is done with a series of 15-foot-high benches. To do this, a bench round is shot toward the hanging wall leaving the original footwall incline in place as main haulage way.

This bench round is a wedge-shaped slice starting with zero thickness from incline and thickening to a maximum of 15 feet, at which point it reaches the bench round started from the next higher crosscut (150 feet further from shaft). This establishes a multiple bench with the higher being advanced ahead of the lower. Stoping proceeds in this manner away from shaft with the height of the stope progressively increasing.

Once the main heading has been advanced several hundreds of feet from the shaft, there are many possible ways to open up more headings and stopes. The first is to turn a heading 180° and follow the footwall back toward the shaft climbing 10 percent all the time. From this heading a second drift can be turned southeast along the footwall and 75 feet higher than the original heading. Pillars, of course, are maintained from level to level.

A typical 20-foot-high by 45-foot-wide main heading round will be 75 holes drilled around a five-hole box burn cut to break a 10-foot-deep round.

Location of all holes, as well as the outline of the heading, are carefully marked on the face in red paint by a boss before round is drilled. There are four Caterpillar D4, three machine Jib jumbos available for drill-



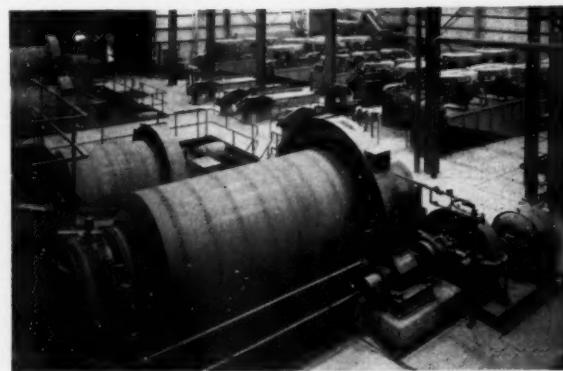
DIAMOND DRILLING has been key exploration tool at the new zinc district.

Dolomite; Three Types Sphalerite, Pyrite, and Minor Galena are Sulphide Minerals

walls. The fracturing and brecciation pattern within the ore body is similar to the Mascot-Jefferson City district. It is intense, with blocks being cemented with sulphide minerals and white dolomite.

Mascot-Jefferson City ore mineralization is a very light-colored, clear sphalerite with small amounts of pyrite only occasionally present. Flat Gap sphalerite has three distinct colors—light clear yellow, a light chocolate brown, and a darker brownish-grey shade. The latter colored sphalerite is massive, shows only poor crystallization, and is difficult to recognize underground by other than the skilled mine staff. Pyrite is found fairly abundantly. The new mineral for east Tennessee is galena; in fact, the total absence of this mineral in the Mascot-Jefferson City district has long identified it as a "lead-free zinc district".

At Flat Gap galena occurs in distinct crystal aggregates up to one-half inch across. It is by no means rare, and careful inspection of many mine faces shows it to be present. It is certainly not an ore mineral, however.



FLOTATION MILL treats 2,000 tons per day to recover zinc concentrates only. Two identical circuits give tonnage flexibility.

From a Series of Large 10° Inclined Drifts Driven From Shaft Along Foot Wall

ing. Using extendable booms, 3-inch Gardner Denver machines on these jumbos drill flat back holes 20 feet above bottom and corner lifter holes 22.5 feet from center line of heading. Seven-eights-inch steel with integral tungsten carbide bits is used for drilling. All rounds are blasted electrically.

Broken ore is loaded with three Eimco 105 overshot loaders, one Koehring 205 Scooper shovel, or a Hough Payloader into six, model 60, Koehring Dumptors. Also in use is a new Transloader which both loads and hauls to the ore pass at shaft.

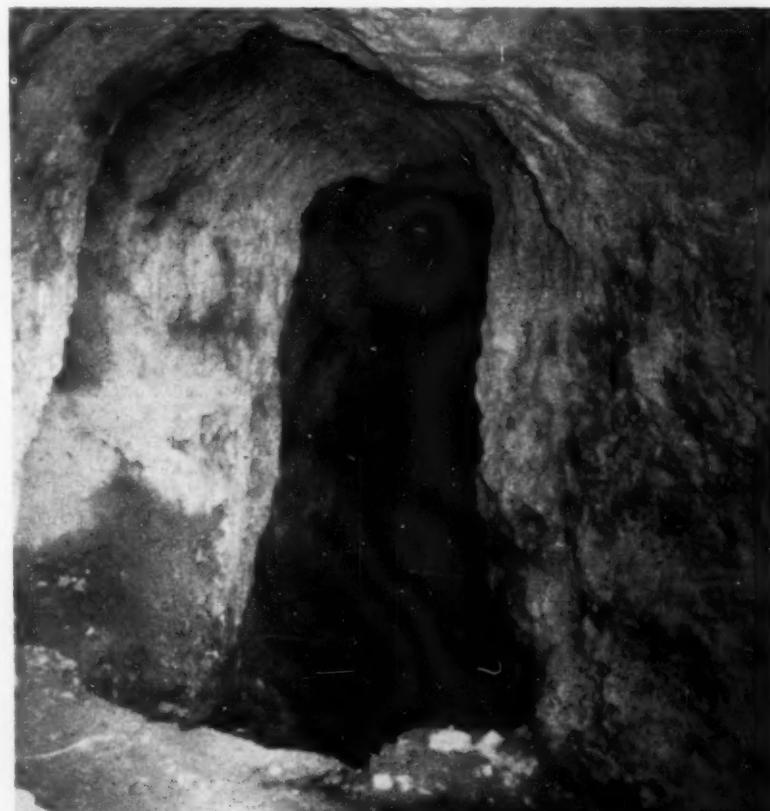
A Caterpillar D 4 bulldozer is used to push blast-scattered ore into muck pile for easy loading. Haul roads are maintained with a motor grader. A 40-foot Pitman giraffe is used to scale backs.

All bench rounds are drilled with same jumbos used for headings. Tests have shown that flat lifter holes have these advantages over vertical holes on the 15-foot-high benches: holes are easy to drill as no cleaning is needed for collaring; the method is safe as missed holes can be easily seen; it's easier to shape pillars, and such pillars aren't shattered as badly as with vertical holes.

Ore is crushed underground in a Birdsboro 36- by 48-inch jaw crusher with a 12-to-1 ratio to produce a minus-4-inch product. The five-ton skips are loaded automatically and hoisted automatically to the surface. This loading and hoisting system, built by Roberts and Schaefer and Electric Control & Manufacturing Company, is the first in the world to use alternating current. Only two

men, a crusher operator who controls feed rate to crusher and a skip tender are needed.

The Flat Gap operating staff is headed by Johnson Crawford, assistant manager of mines for the New Jersey Zinc Company; James I. Craig, superintendent; Al Savage, mine chief; Jack Nelson, mill chief; and Tom Wayland, mine geologist. END.

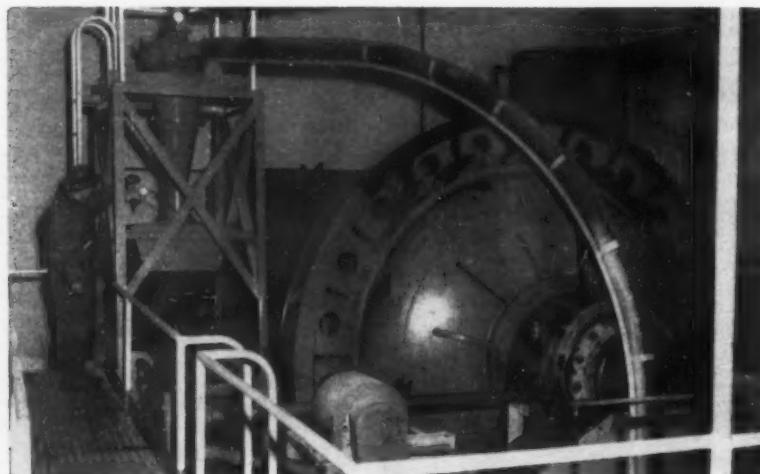


OPEN STOPE on 350-foot level. This stope extends along the strike of the ore body. Stopes are enlarged by taking 15-foot high cuts out of bottom.

Lucky Friday Mill—Small in Size



1. Newest mill in Idaho's Coeur d'Alene lead-zinc-silver district is the 500-ton selective flotation mill of Lucky Friday Silver-Lead Mines Company east of Mullan. It took only nine months to build this new mill, and place it in operation in February. Hecla Mining Company's staff collaborated with Lucky Friday's engineers, and Wray Featherstone, construction superintendent, to design and build this modern mill. Grinding-flotation building is at left, next is fine ore bin, crushing plant, coarse ore bin, and belt conveyor extending into and through main adit to collar of winze. Gordon Craig is mill superintendent.



3. Ball mill grind is to 56 percent minus-200-mesh in this 10 by 8-foot open-discharge Union Iron Works of Spokane mill. Mill discharge is pumped by a 4 by 6 VacSeal pump through a 5½-inch inside diameter rubber pipe to the Krebs cyclone shown at left. This 15-inch cyclone operates at about 6.0 pounds pressure. Cyclone overflow goes to lead circuit and underflow drops to scoop box. The pump is protected by ¼-inch vibrating screen; oversize is returned to mill feed by conveyor belt. Ball mill is fed by conveyor belt with feed tonnage rate controlled by a Marquardt Con-O-Weigh system.



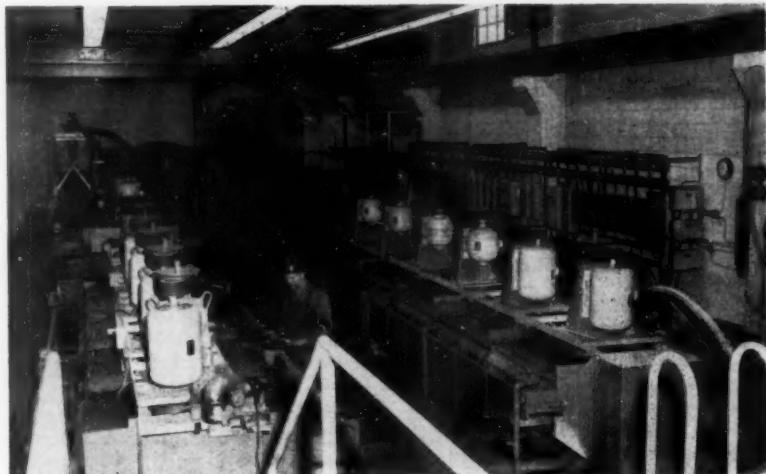
5. Filters are set directly above the concentrate storage bins in the south end of the 50 by 168-foot mill building so that concentrates drop directly into bins. Railroad cars are spotted on a track scale and loaded to predetermined capacity with a front end loader in about 40 minutes each. The loader operates on the concrete floor forming the bin bottom. This four-disc lead filter makes a 70 percent lead concentrate with less than 9.0 percent water. No filtering agent is used. Thickeners are mounted between the flotation section and filters. Note four plastic hoses used to carry concentrate from distributor.

For 500-Ton Unit, Has High Recovery

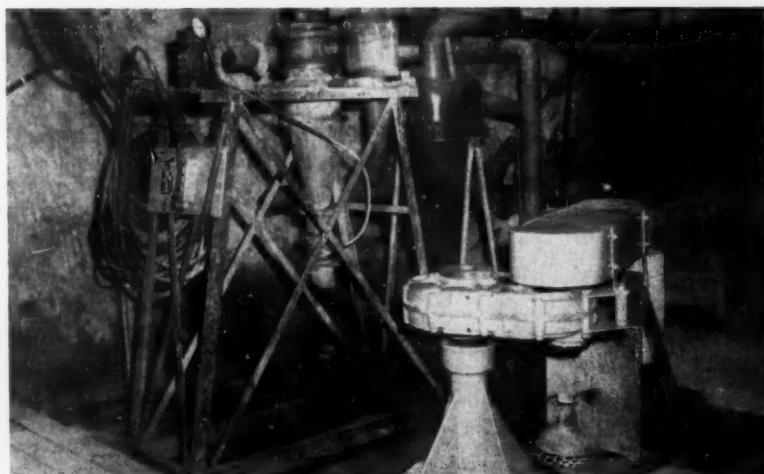
2. Two stage crushing, a primary jaw which produces minus- $2\frac{1}{2}$ -inch product, and a secondary cone produce fine ore from mine-run. This picture shows 3-foot standard Symons with Jim Lower, design engineer. This crusher is set to produce a minus- $\frac{1}{2}$ -inch ball mill feed from screened primary feed which is minus- $2\frac{1}{2}$ -inches, plus- $\frac{3}{4}$ -inch. The fine ore bin has a live capacity of about 550 tons so the crushing plant is operated only one shift per day to keep the mill supplied for three shifts. Both the primary and fine ore bin use pre-cast concrete staves. See January 1960 MINING WORLD, page 47, for details.



4. Flotation section is all on one floor for easy control and operation. At left is the lead rougher bank, 12 56-inch Wemco Fagergrens. In the right foreground are six Fagergren zinc rougher cells. The Denver Sub-A No. 21 cleaner cells are in the right background; four lead cleaners and two zinc cleaners. Dick Holmgren, mill operator checks concentrate grade. Reagents used are zinc sulphate, methyl amyl alcohol, Z-3, copper sulphate, Minerac, and Barrett oil. Overhead fluorescent lighting assures uniform light for operators to check flotation results. Traveling crane speeds repairs and ball mill lining.



6. Sand filling of stopes is now possible at Lucky Friday with the new mill furnishing a ready source of mill tailing. This picture shows the top of the sand storage agitation tank on the main adit level; a short distance from main shaft. When sand is required in the mine, the entire mill tailing is pumped from the mill through the pipe at top right to the Krebs cyclone in center. When sand filling is not required in the mine the mill tailing is diverted directly into the tailing line. When the agitation tank is being filled with sand the cyclone slime overflow is returned to the normal mill tailing line.



UNION CORPORATION, LIMITED

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ING/EJB.

25th January, 1960.

The Editor,
World Mining,
500, Howard Street,
San Francisco 5,
California,
U.S.A.

Dear Sir:

SURVEYING OF SMALL
DIAMETER BOREHOLES

We enclose an article which describes a bore-hole survey instrument using electronic principles for continuously recording the direction and inclination of small diameter boreholes which we think may be of interest to many of your subscribers whose business from time to time involves the drilling of boreholes from surface for prospecting purposes.

This instrument has been developed by officials of this Corporation but because of its possible value to all Companies concerned with drilling operations we think it preferable to publicise this information and to make it freely available rather than to patent it. We should be happy to assist any of your readers wishing to develop this device for their own use.

We wonder therefore whether it would be possible for you to publish this article in your Journal. If you are able to do so could you perhaps let us know in which number of your Journal it is likely to appear as we would wish to order extra copies.

Yours faithfully,

UNION CORPORATION, LIMITED.

M. G. L.
DIRECTOR

A drillhole survey instrument using electronic principles for continuously recording the direction and inclination of small diameter holes to depths of 10,000 feet has been developed by Union Corporation, Limited, Johannesburg, Union of South Africa.

Instruments used to date for hole surveys use a magnetic compass and inclinometer, the deviations of which are recorded photographically in the body of the instrument. Single records are obtained requiring the lowering of the instrument down the hole and removal from the hole for each measurement. More refined instruments use multishot cameras with a timing mechanism, usually clockwork, to photograph direction and inclination at predetermined depths down the hole. A facility is often provided whereby the bottom of the hole is marked by a scratcher. The direction of the scratch mark serves to orient the core when removed from the hole. Knowing the direction and inclination of the hole and orientation of the scratch, true dips of strata can be determined. This facility can also be

provided on the electronic drillhole survey instrument.

The electronic drillhole survey instrument provides a continuous record at the surface from which inclination and direction of the hole can be determined at any desired depths down the hole.

The compass of the electronic survey instrument uses the well known flux valve principle. Ambiguity of recording is avoided by using two flux valves at 90° to each other, though any preferred angle may be used. The system rotates with the body of the instrument but in a horizontal plane. Changes of magnetic flux as each unit sweeps through the earth's horizontal field produce changes in certain parameters of the oscillating current fed to the units. The recording of one or other of these parameters determines the direction of each unit at each instant of time. These recordings alone give only the orientation of the instrument barrel but used in conjunction with the inclinometer recordings will determine the direction of devia-

tion of the hole.

Two inclinometers are provided, each moving in a plane mutually at right angles to that of the other, the planes of movement being in the direction of the instrument barrel and therefore of the hole. The movement of an inclinometer changes the inductance of a system of coils in a bridge circuit, and an electrical recording is obtained at the surface for each inclinometer. The resultant of the two recordings determines the inclination of the hole.

As the planes of the inclinometers are fixed in relation to the position of the flux valves and all are fixed within the barrel of the instrument, the orientation of the instrument in the hole is known and the direction of the hole is then determined.

The continuous record can either be picked at any desired interval and the hole inclination and direction determined by simple calculation, from charts, or further electronic means can be provided to give these parameters directly on a continuous record.

Union Corporation

Invites you

To use its new continuous

Recording instrument

To survey

Small diameter drill holes

M. A. Hanna Company

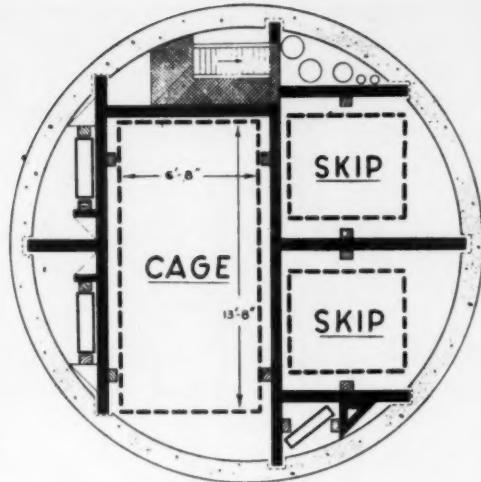
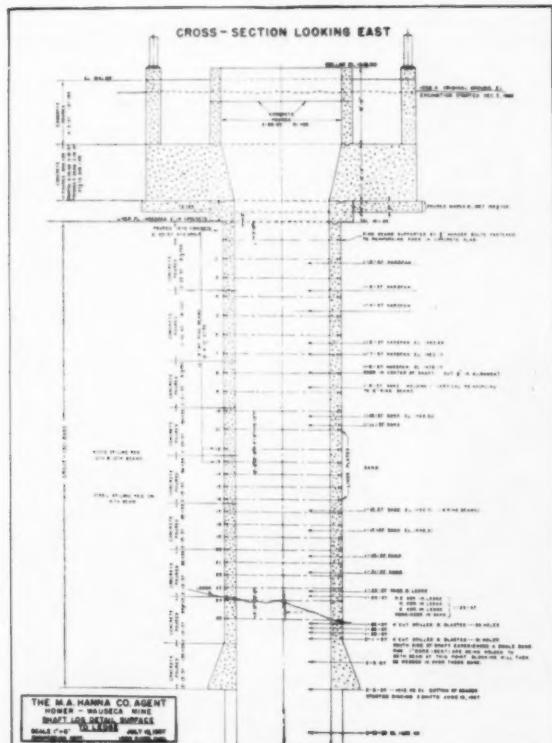
Sinks Circular Shaft

uses two deck work stage suspended from three winches . . . a shaft jumbo which was centered under a plumb line . . . an Eimco 630 for mucking . . . and specially designed "thin" steel forms for concrete

By R. W. Peterson

The Iron Ranges' newest shaft went into operation on July 9, 1959 when the first skip of ore was hoisted through the 2,745-foot-deep, Homer-Wauseca shaft at Iron River, Michigan. This 20-foot inside-diameter, concrete lined shaft was sunk by the M. A. Hanna Company to service both the Homer and Wauseca iron mines on Michigan's Menominee Range. Walsh Construction Company of New York, New York sunk the shaft under contract.

Mr. Peterson is chief mining engineer for the M. A. Hanna Company, Iron River, Michigan.

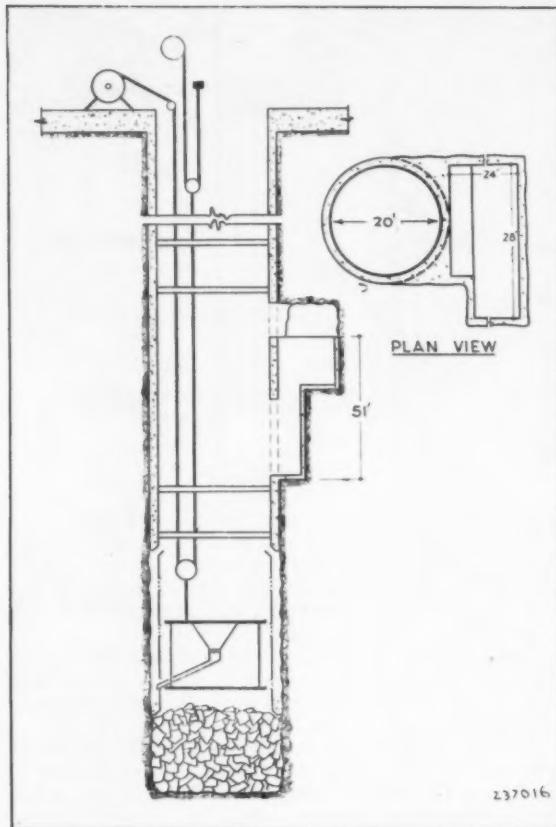


Hanna's engineers picked a round shaft because it could be fully concreted to shut off water inflows which would come from glacial overburden and a faulted zone. A dry shaft was important because it would minimize rope and pulley wear for the Koepf hoist.

The shaft would also have to cross the fault zone where bad ground would require support. A circular cross section afforded best support during sinking and would minimize maintenance during the life of the shaft.

The initial sinking of the shaft started on December 3, 1956 with the excavation of 26 feet of ground using a dragline. At the bottom of this excavation, a circular, reinforced, 5-foot-thick, concrete collar was poured with an inside diameter of 20 feet. Sinking through the remaining 84 feet of the soft ground section and into 20 feet of ledge rock was done with a Bucyrus-Erie 54-B crane using a 1.5-cubic-yard clam. As the soft ground section was mucked out, liner plates, reinforced with ring beams, as shown on cross section of shaft collar, were placed for lateral support. The liner plates were $\frac{3}{8}$ -inch steel plate rolled to a 12.5-foot radius. Each liner plate was 3.14 feet long, 16 inches wide, with a 1.5-inch rolled flange, drilled at 4-inch centers on all four sides so that each plate could be positioned and bolted to any adjacent plate, thus forming a circular steel wall, 25 feet in diameter, against the ground. The length of 3.14 feet enabled the use of a standard sized plate throughout. As the liner plate wall was advanced, ring beams made of 8-inch, 31-pound steel sections, rolled to a 12.5-foot radius, were installed at 4-foot centers and then, when a very fine sand was encountered, to 2-foot, 8-inch centers.

The aforesaid operation continued until the shaft had been sunk about 20 feet into ledge rock (approximately 130 feet below the original surface). At this point, the excavation was flared out to form a footing, and concrete with reinforcement was then poured from the bottom to the surface. Circular steel forms of 20-foot diameter, in four complete 5-foot sections, were used. The concrete was poured in 10-foot lifts. Forming was done by collapsing the two bottom 5-foot sections and seating them on top of the previously placed higher sections that are anchored to the hardened concrete by anchor bolts, which had been embedded in the concrete to receive the ensuing steel sets. After the concrete was poured up to the temporary collar, grouting behind the liner plates was done to fill all voids and to consolidate the ground behind the shaft wall. Construction of the headframe foundation was then completed to bring the shaft up to the permanent ground level elevation.

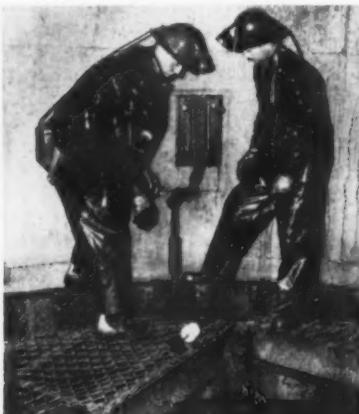


TYPICAL VERTICAL SECTION showing how two-deck stage is hung. Plan is for station.

Complete use of 30-foot concrete forms required four days . . . one day for pouring

After the bottom of the shaft was cleaned, the drilling and mucking cycle was continued until a point was reached where the broken rock was approximately 30 feet below the last concrete pour. At this time, the 20-foot-diameter forms, designed by Blaw-Knox Company of Pittsburgh,

Pennsylvania, which had been originally introduced into the shaft by being lowered in sections through the steel sets and assembled at the bottom of the shaft, were then hung and leveled from the previously embedded anchor bolts with chain and turnbuckle. They were also plumbed by



ANCHOR BOLTS in concrete lining support the steel forms which are carefully positioned with turnbuckles.



POUR DOOR through which concrete is placed behind forms. Door is closed and two anchor bolts embedded in concrete.

Equipment and Cycle Breakdown

DRILLING

Shaft jumbo: Chicago Pneumatic.
Number of machines: Four 3.5-inch drifters.
Rods: 10-foot by 1-1/4-inch round, carburized.
Bits: 1-7/8-inch with carbide inserts.
Rod and bit life: Approximately 1,000 feet.
Average round: 72, 9-1/2-foot holes.
Drilling time: 1 hour, 45 minutes.
Complete in and out time for jumbo: 2 hours, 20 minutes.

POWDER

Type: 1-1/2 by 8-inch 40 percent Hercules Gelex.
Breaking ratio: 5 pounds per cubic yard of excavation.
Loading time: 1 hour.

The Sinking Cycle: Pull eight-foot round

The sinking portion of the permanent headframe was erected and an 800-horsepower sinking hoist was installed approximately 250 feet from the shaft.

A 17-foot-diameter, two-stage work deck was then placed in the shaft and suspended by three small electric winches anchored on the collar. The horizontal steel sets were then placed at 10-foot intervals to within 70 feet of the shaft bottom. Attached to the steel sets were ventilation, water and air pipes, electric cable, and the temporary wooden guides used to guide the crosshead (equipped with safety dogs) which, in turn, guided all of the equipment used in sinking the shaft.

By placing these steel sets closely behind sinking, it made the shaft much safer to work in. Safety rules required that fixed ladders be carried close to the shaft bottom at all times. Sets were the best method to support these ladders.

After placing the first portion of steel, the actual shaft sinking cycle, which is described in the following para-

the use of horizontal screw jacks placed between the rock and the bottom of the form. Broken rock was then shoveled against the bottom of the form to block the passage of concrete from behind the form. This form was also equipped with a keyway and ratchet jacks so that it could be collapsed slightly to break the bond with the concrete and lowered to its next position with the three winches on the collar.

A 2-cubic-yard concrete bucket was then attached to the crosshead and concrete placing begun. The concrete was lowered and deposited into a chute (located in the work deck) which guided the concrete through the pour doors, spaced at 5-foot vertical intervals, in the form. After the concrete was raised to the first pour door elevation, the doors were closed with the anchor bolts, and embedment sleeves were attached. These anchor bolt sleeves were thus embedded in exact predetermined positions to receive the ensuing steel sets. Concrete pouring was continued through the doors above. After finishing the 30-foot pour, three additional

at the Homer-Wauseca Shaft

Smoke delay: 30 minutes.
Electric blasting: 8 standard delays.

MUCKING

Mucking machine: Eimco 630 loader with 11-cubic-foot bucket.
Hoist: 800 horsepower at 1,000 feet per minute (unbalanced).
Buckets: Two, 100-cubic-foot (5-foot high, 5-foot diameter).
Mucking time: 7 to 11 hours per round, depending on depth, plus 1 hour for cleaning bottom.

FORMING AND CONCRETING

Strip and set form: 8 hours (average).
Average 30-foot pour: 147 cubic yards.
Pouring rate: 18 cubic yards per hour.
Install three sets of steel at 10-foot intervals, plus construction pipe and guides. Time, 8 hours.

..... load muck into 100 cubic foot buckets

graphs, began on June 19, 1957.

The Chicago Pneumatic shaft drilling jumbo was placed under the crosshead by means of a crane located in the headframe. The jumbo was then lowered to the bottom of the shaft and centered under a plumb line. Drilling started, with the hole pattern spaced by eye. The normal round consisted of seventy-two, 9.5-foot holes which pulled about an 8.5-foot round. Drilling time averaged 1 hour, 45 minutes, while overall in-and-out time for the drill jumbo averaged 2 hours, 20 minutes. After the jumbo had been removed from the shaft, a 100-cubic-foot bucket was attached under the crosshead and the powder and electric blasting accessories were lowered in it to the bottom. After blasting, an Eimco 630 loader was lowered to the bottom and used to shovel the broken rock into a 100-cubic-foot bucket. The bucket was raised to surface and the broken rock was discharged into a truck by means of a chute. At the same time, a second bucket was being loaded at the bottom.

..... three days for curing

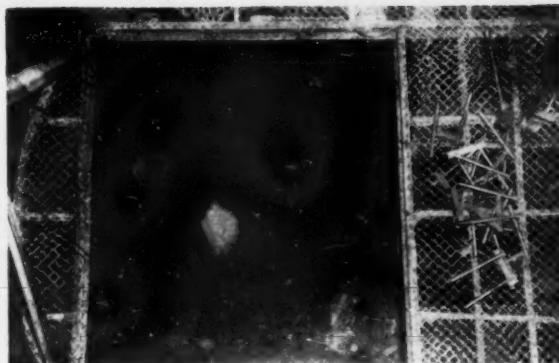
sets of steel, pipe, and wooden guides were added while allowing curing time for the concrete. The Eimco 630 loader was again lowered to the bottom of the shaft and the remaining rock removed.

The drill jumbo was then lowered and the cycle was begun anew. The forms remained in their last position to protect the green concrete from blasting damage until the broken rock pile was again 30 feet below the bottom of the last pour. The anchor bolts for the steel sets were then removed from their embedded sleeves to permit the form to be sprung from the concrete and lowered into the new position for the next pour.

As the shaft was being sunk, six large crusher stations and one intermediate loading station were excavated and concreted so that average advance-per-day data is not available. However, the best advance in any one month was 216 feet on a three-shift, six-day-per-week basis.

Installation of the crusher equipment, discharge lines, power cable, etc., followed to complete the shaft for first ore hoisting.

END



MUCK IS HOISTED through this door in the two-deck sinking platform during the time the concrete is setting up.



STEEL FORMS are lowered 30 feet by three winches at shaft collar. Forms and working stage are hung separately.



STRIPPING STEEL FORMS from concrete section of Homer-Wauseca shaft. This steamboat ratchet is used to break the form loose by pulling it inward from concrete. The 30-foot-high forms are then lowered and placed for next concrete pour.

**"ON OUR GRANTS, NEW MEXICO WORK
FLYGT PUMPS ARE THE ONLY PUMPS
WHICH CAN DO THE JOB,"**

reports

**BOYLES BROS.
DRILLING CO.
Salt Lake City, Utah**

Well-known as mining contractors, engineers and geologists, Boyles Bros. Drilling Co. are sinking a variety of shafts in the famous Ambrosia Lake uranium district near Grants, New Mexico. The roster of Boyles Bros. customers includes leading names in the mining and petroleum industry — firms which demand efficient equipment to obtain top performance. When it comes to dewatering, Boyles Bros. depend on Flygt Electric, Submersible Pumps.

Boyles Bros.' Mr. Victor L. Stevens, in his own words, puts it this way: "We have on our shaft jobs in Grants, New Mexico, 3 Flygt B-150s and 9 Flygt B-80Ls, and these pumps are solving the big problem in the Grants area, which is abrasive sand particles wherever water is encountered.

"We are using the Flygt B-150s and B-80Ls to handle a good part of our water, and they are very successful pumps. We feel that Flygt pumps are the only pumps that we know can do our job.

"We are concreting as we sink some of the shafts. When we hit water a lot of the cement washes out of the concrete lining and it is handled by the Flygt pumps. Where we were cement grouting off the water, a large amount of the cement went into the shaft and was pumped out by the Flygt Pumps," Mr. Stevens concludes.

Additional satisfied users of Flygt Pumps in mining applications include Climax Molybdenum Mines in Colorado, Inspiration Copper Mine in Arizona, Kermac Nuclear Fuels in New Mexico, Lucky Friday Silver-Lead Mines in Idaho, Utah Construction Co. in San Francisco, San Manuel Copper Mine in Arizona, White Cap Gold Mining Co. in Nevada, and others.

Flygt Electric, Submersible Pumps range from 1 1/2" 85 gpm to 8" 3100 gpm capacity. Heads to 220'. Higher heads are possible with Flygt Pumps in tandem. Ask today for literature and an on-the-job demonstration.



CHECK THESE FLYGT FEATURES

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- ✓ Heavy Duty
- ✓ Resistant to Salt Water
- ✓ Operates Unattended
- ✓ Submersible
- ✓ Runs Dry Without Damage
- ✓ Easy to Handle
- ✓ Quick and Easy to Service
- ✓ Low Maintenance Costs
- ✓ No Installation Costs
- ✓ Will Pump High Amount of Solids
- ✓ No Priming Needed

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1666 Ninth St. (Corner of Olympic & Ninth)
Santa Monica, California

Metal & Mineral Prices

U.S.A.

METALS

March 18, 1960

COPPER: Electrolytic, Delivered F.o.b. cars, Valley basis (pound)	33.00¢
Lake, Delivered, destinations, USA	33.00¢
Foreign, Delivered, destinations, USA	33.00¢
Custom	33.00¢
LEAD: Common Grade, New York (Per pound)	12.00¢
Tri-State Concentrate, 80% lead, per ton	\$141.72
ZINC: Prime Western: F.o.b. E. St. Louis (Per Pound)	13.00¢
Prime Western: Delivered New York	13.50¢
Tri-State Concentrate, 60% zinc per ton	\$80.00
ALUMINUM: Primary 30 Pound Ingots (99.5% plus) (Per pound)	26.80¢
ANTIMONY: Lane Star Brand, F.o.b. Laredo, in bulk (Per pound)	29.50¢
BISMUTH: (In ton lots) price per pound	\$2.25
CADMIUM: Sticks and bars, 1 to 5 ton lots Price per pound	1.50
COBALT: 97.99%, kg of 550 pounds (Price per pound)	\$1.50
COLUMBIUM: Ingots	Nom., per pound \$55.00-\$85.00
GERMANIUM: dioxide, high purity, gram	18.50¢
LITHIUM: 98% (per pound)	\$9.00-\$12.00
MAGNESIUM: Ingots (99.8%) F.o.b. Velasco, Texas per pound	36.00¢
MERCURY: Flasks, Small lots, New York	\$213.00-\$215.00
NICKEL: "F" Ingots (3 pounds), F.o.b. Port Colbourne, Ontario	75.50¢
PLUTONIUM: To July 1 1962 AEC will pay \$30.00 to \$40.00	
per gram depending on plutonium 240 content. July 1, 1962 to June 30, 1963, per gram	\$30.00
SELENIUM: 99.5%, per pound	\$7.00
TELLURIUM: Common grade, Per pound	\$3.00
THORIUM: per kilogram	\$43.00
TIN: Grade A Brands, New York (Per Pound) Prompt delivery	\$1.0025
TITANIUM: 98.3% + Grade A-1 Sponge (Per pound)	\$1.50-\$1.60
URANIUM: Red (0.790 U-235) \$16.00 Per Pound; Foil	\$16.75
U-235: Nominal (Per pound)	\$7.725
GOLD: United States Treasury Price	\$35.00 per ounce
SILVER: Newly mined domestic, U.S. Treasury price per ounce	90.5¢
Foreign Handy Harmon	91.5¢
PLATINUM: Per ounce	\$82.00-\$85.00
ZIRCONIUM: Sponge, Per pound, Reactor Grade	\$5.00

ORES AND CONCENTRATES

BERYLLIUM ORE: 10 to 12% BeO, F.o.b. mine, Colorado	\$46.00 per unit
Small lot purchases at Custer, S. D., Spruce Pine, N. C., and Franklin, N. H. Visual inspection at \$400.00 per short ton or by assaying at 8.0 to 8.9% BeO, \$40 per unit; 9.0 to 9.9% \$45; over 10.0%, \$48.00.	
CHROME ORE: F.o.b. railroad cars eastern seaports. Dry long tons, African (Rhodesian), 48% Cr ₂ O ₃ , 3 to 1 Ratio	\$35.00-\$36.00
African (Transvaal), 48% Cr ₂ O ₃ , No ratio	\$28.00-\$32.00
Turkish, 48% Cr ₂ O ₃ , 3 to 1 chrome-iron ratio Nominal \$36.00-\$37.00	
U.S. Government ore-purchase depot Grants Pass Oregon. Buying suspended, quota filled.	
COLUMBIUM-TANTALUM ORE: Per Pound Pentoxide Nominal \$1.00	
IRON ORE: Lake Superior, Per gross ton Lower Lake Ports	
Mesabi, Non Bessemer, 51.5% Fe	\$11.45
Mesabi, Bessemer, 51.5% Fe	\$11.60
Old Range Non Bessemer	\$11.70
Old Range Bessemer	\$11.85
Swedish, Atlantic Ports, 60 to 68% Fe Contracts, Per Unit	\$24.00-\$25.00
MANGANESE ORE: Metallurgical grade, 48 to 50% Mn Long ton unit	\$0.95-\$1.00
Metallurgical grade, 46 to 48% Mn, Long ton unit	\$0.90-\$0.95
Metallurgical grade, 44 to 46% Mn, Long ton unit	\$0.80-\$0.85
Domestic U.S. Government, GSA Basis \$2.30 per unit for 48% mn.	
MOLYBDENITE CONCENTRATE: 90% Mo ₃ F.o.b. Climax, Colorado. Per pound Mo, plus container cost	\$1.25
TUNGSTEN CONCENTRATE: Domestic, 60% WO ₃ Per short ton unit	Nominal \$24.00
Foreign: 65% WO ₃ Per short ton unit (Scheelite)	Nominal \$18.00
Foreign: South American, Spanish, Portuguese	Nominal \$17.00
URANIUM ORE, F.o.b. purchase depot or company mill in accordance with AEC schedules and company buying contracts. Basic price is \$1.50 per pound of U ₃ O ₈ in ore assaying 0.10 percent. For each additional 0.01 add 20¢. Subject to development allowance, premiums, penalties where applicable.	

NON-METALLIC MINERALS

BARITE: Oil well drilling. Minimum 4.25 specific gravity, per short ton	
BENTONITE: Minus-200mesh, F.o.b. Wyoming. Per ton, car-load lots	\$16.00
OIL WELL grade. Packed in 100 pound paper bags	\$12.50
BORON: technical grade, F.o.b. Boron, California. Per ton	\$47.50
FLUORSPAR: Metallurgical grade, 72.5% effective CaF ₂ content per short ton F.o.b. Illinois-Kentucky mines	\$37.00-\$41.00
Mexican, 70% CaF ₂ , F.o.b. border	\$26.00-\$27.00
Acid Grade, 97% CaF ₂ , Bulk, F.o.b. mine	\$45.00-\$49.00
PERLITE: Grade, F.o.b. mine per short ton	\$3.00 to \$5.00
Plester grades. Crushed and sized. F.o.b. plants	\$7.00 to \$9.00
SULPHUR: Long ton, F.o.b. Hoskins Mound, Texas	\$22.50-\$23.50

London

March 18, 1960

Per Long Ton USA Equivalent cents per pound*

COPPER: Electrolytic spot	£ 24s	10s 0d	30.89¢
LEAD: Refined, 99%	£ 7s	12s 0d	9.45¢
ZINC: Virgin 98%	£ 88s	15s 0d	11.09¢
ALUMINUM: Ingot, 99.5%	£ 186	0s 0d	23.25¢
ANTIMONY: Regulus, 99.6%	£ 197	10s 0d	24.69¢
TIN: Standard, 99.75%	£ 788	0s 0d	98.50¢
TUNGSTEN: Long ton unit	£ 149s		\$20.80¢

*With Sterling Pound at \$ 2.80

Quotations on metals and certain ores through the courtesy of American Metal Market, New York, N. Y.

MORE NEW EQUIPMENT... AND NEW LITERATURE

FILTER CLOTH comparison chart classifies cotton, nylon, orlon, dacron, and silicone treated glass fabrics according to temperature limits, strength, resistance to acid, etc. It's available from Wheelabrator Corp. Circle No. 42.

VIBRO ENERGY MILL, soon to be placed on the American market by Southwestern Engineering Co., utilizes a patented system for both wet and dry grinding. The mill is said to apply a new principle of high frequency vibration and circular movement to a grinding media which effects particle size reduction to sub-micron range. Circle No. 43.

TRACK ADJUSTER: A hydraulic track adjuster, replacing a screw type, has been developed by International Harvester Company's Construction Equipment Division. It will be standard on all future International TD-20 crawlers. Circle No. 44.

MIXER-SETTLER UNIT for use in solvent extraction process is the subject of a design study in Bulletin No. M7-F65 by Denver Equipment Company. Circle No. 45.

WELDING DATA: Air Reduction Pacific Company has just issued a newly revised 36-page catalog on gas welding and cutting hand torches, outlets, tips and accessories. Circle No. 46.

CENTRIFUGAL SEPARATOR: Operating principles and photomicrographs of several materials handled by a new multi-stage, push-type centrifugal separator are included in a new brochure available from Chemical Machinery Division of Baker-Perkins Inc. Circle No. 47.

REBUILD TRACTOR RAILS: New four-page data sheet goes through step-by-step procedure, with diagrams, showing proper method of hardfacing tractor rails. Published by Rankin Manufacturing Company, the deposit is said to provide a smooth working surface without grinding. Circle No. 48.

TRICONE MILLS: Hardinge Company states that the Tricone mill with a tapered shell results in correct ball segregation, thereby yielding highest grinding efficiency with lowest ball and lining wear. Complete specifications are contained in Bulletin AH-414-3. Circle No. 51.

UNDERGROUND TRUCK featuring Diesel drive, 10-ton carrying capacity, and low silhouette is available from Getman Brothers. Truck has special solid type tires said to be nearly as flexible as pneumatic tires. Circle No. 1.

TRACK PIN PRESS for servicing tracks on small crawler type tractors has been improved according to Owatonna Tool Company, 656 Cedar Street, Owatonna, Minn. Circle No. 2.

SYNTHETIC ROPE, especially designed for pulling in overhead electrical conductor on transmission and distribution lines, has been developed by Peterson Engineering Co. Inc. It's reported to have excellent di-electric properties. Circle No. 3.

PORTABLE POWER TOOL of earth auger design has been announced by General Equipment Company. It is available with augers in 4, 6, 7, and 8-inch sizes. Circle No. 4.

NEW CRANE of 65-ton capacity is convertible to dragline, shovel, trench hoe or clamshell. Model 3400, made by Manitowoc Engineering Corp., is described by new catalog. Circle No. 7.

BULLDOZER BLADES and cable control units for the TD-25 tractor of International Harvester Company of special design are now in production, the company announces. Circle No. 8.

MAGNETIC PULLEYS: Stearns Magnetic Products has recently announced an extension of its line of Indox V permanent magnetic pulleys to include a complete range of sizes from 12 to 48 inches. Circle No. 9.

PENDENT SWITCH for electric hoist control is described in a new bulletin by Joy Mfg. Company. Circle No. 10.

CRAWLER TRACTOR: The TD-25, largest Diesel tractor made by International Harvester Company, is discussed in a 24-page bulletin that highlights such features as: planet-power steering; Dura-Rollers with 1,000 hour lubrication intervals; a lubrication oil cooler and other advantages. Circle No. 12.

NEW MULTI-CHANNEL RADIO reportedly provides four separate channels to give the user the convenience and flexibility of a conference phone, and also provides uniform performance over the entire 22-channel Class D Citizens Band. Unit is made by Vocaline Company of America. Circle No. 13.

NEW SHOVEL with 35-yard bucket is featured by a 24-page catalog released by Thew Shovel Company. The model is L85A and it is available also as a crane, clam, dragline and hoe. Circle No. 14.

POLARIZING MICROSCOPE developed by Bausch & Lomb is expected to provide geologists, mineralogists, chemists with a new research tool. New features include new coated optics, swing-in circular polarizer, fine adjustment and others. Circle No. 15.

HIGH PRECISION LEVEL is claimed to have highly dependable accuracy, and features tilting screw coincidence

APRIL 1960

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NUMBERS OF
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1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40	41	42	43	44	45
46	47	48	49	50	51	52	53	54	55	56	57	58	59	60

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71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90
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level and built-in optical micrometer. Wild Heerbrugg Instruments, Inc. booklet N-111 describes the instrument. Circle No. 16.

CORE BARREL: Acker-Denison core barrel is capable of obtaining undisturbed top quality cores from soft but difficult formations. Made by Acker Drill Company, it is useful for soil sampling and other applications. Circle No. 17.

COMPLETE TEST EQUIPMENT for laboratory and research investigation is available from Denver Fire Clay Company. Circle No. 18.

TUBING STEEL: A new folder by Babcock & Wilcox Company suggests two general purpose steels that might lend themselves to standardization purposes and help eliminate selection problems resulting from the bewildering assortment of alloy steel tubing. Folder TDC-193 discusses the two types. Circle No. 19.

FORGED STEEL WHEELS for mine cars is the subject of a new booklet prepared by Bethlehem Steel Company. Circle No. 20.

NEW PIPE THREADER can handle 2½ to 4-inch pipe and conduit without changing dies, reports Ridge Tool Company. The unit is also claimed to be jam-proof. Circle No. 21.

CHAIN & SPROCKETS: Most extensive line ever offered by Dodge Mfg. Corp. is presented in a new 56-page bulletin. Circle No. 22.

ROPE THREAD BITS, STEEL for drill purposes have these advantages, report Atlas Copco: 40 percent more usable life; can be uncoupled by hand all the time; premature rod breakage is almost non-existent. For data circle No. 23.

GEARING PRODUCTS: A 28-page manual which can serve as a selection guide to worm gear speed reducers has been published by David Brown, Inc. Complete specifications, horsepower ratings and selection tables are included. Circle No. 31.

LABORATORY FLOTATION: Booth Company has developed an improved laboratory flotation machine which is said to be a carefully proportion unit that represents a scale-down of the aerating mechanism in commercial Booth cells. Circle No. 32.

LOAD CELL WEIGHING SYSTEM is the subject of a four-page brochure recently issued by The Howe Scale Company. Heavy duty applications are described. Circle No. 33.

PROCESS COOLER: How Allis Chalmers multiple tube coolers (Warner type) operate to save money five ways is told in a new bulletin published by the company. Circle No. 34.

AUTOMATIC SKIP LOADERS of a new design are available from Lake Shore, Inc. The units are mounted on load transducers and operated similarly to the Jeto bottom dump skip. Circle No. 35.

SELF LOADING TRUCK: New folder contains time studies, maintenance data, and many schematic line drawings showing how Transloader can be worked into almost any mining system, including cut and fill stoping, room and pillar methods, etc. It's published by Sanford Day Iron Works. Circle No. 36.

PROCESS EQUIPMENT for pneumatic conveying, plant air supply and vacuum service, cooling, pumping, etc. is described in a new bulletin published by Fuller Company. Circle No. 37.

PREVENT FUEL OIL SLUDGE: New booklet by Armour Industrial Chemical Company discusses effective dispersants and inhibitors which reduce sludge formation after fuel oils are stored for long periods of time. Circle No. 38.

COLD WELD, made from epoxy resins, was developed to repair many things that cannot successfully be welded, brazed, soldered, or glued, reports Cosmo Distributing Company. Circle No. 39.

FLOTATION INDEX, containing a bibliography of articles in leading publications in 1958, has been published by Dow Chemical Company. Circle No. 40.

MAGNETIC PULLEY: Selection of electromagnetic or non-electric ceramic type is discussed in Catalog C-200 by Dings Magnetic Separator Company. Circle No. 41.

CRUSHER ADJUSTMENT: Allis Chalmers has introduced an electro-magnetically operated sight indicator which registers the close-side setting of its gyratory crusher equipped with Hydro-set adjustment of mainshaft and crusher mantle. Set can be determined without entering the machine. Circle No. 50.

MOTOR SCRAPER: A 20-page catalog reviews the recently introduced 340 hp. 30-yard heaped, TS-300 motor scraper made by Allis Chalmers Mfg. Company. The unit features a double acting hydraulic system for steering and loading. Circle No. 54.

CENTRALIZED LUBRICATION: New 24-page brochure contains information and applications of centralized lubrication systems. Bulletin 26-T is available from Farval Division, Eaton Mfg. Co. Circle No. 52.

CERAMIC FIBER that stands operating temperatures up to 2300° F. and useful as lining for domestic oil burners, induction furnaces, general furnace insulation, etc., is described in a new brochure by Carborundum Company. Circle No. 53.

SHEAVE BLOCKS of quick opening design and forged construction are described by Bulletin 287-8 by Joy Manufacturing Company. Circle No. 24.



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PRODUCTION EQUIPMENT PREVIEW

For data on any item on next three pages
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Diesel-Electric Truck Has Maximum Turning Angle of 60° Left and Right

New 55-ton capacity Diesel-electric truck, made by Unit Rig & Equipment Co., is now undergoing tests. The truck is driven through four General Electric Co. motorized wheels. Each wheel contains a series wound traction motor with integral planetary gear reduction system. Power for the wheels is supplied from a generator driven by a 600-horsepower Diesel engine.

Scheduled for delivery to an iron mining company, the truck is stated to have excellent ability to negotiate adverse grades under full-load conditions. Gradeability, based on 60-pounds-per-ton rolling resistance, is reported as follows: on 15 percent adverse grade, maximum speed of 4.4 m.p.h. can be realized; on 12 percent grade, highest speed is 5.3 m.p.h.; on 9 percent grade, speed of 6.6

m.p.h. is possible; on 6 percent grade, speed of 8.6 m.p.h. is possible; on 3 percent grade, speed of 13.5 m.p.h. is possible; and top speed on level ground is 23.5 m.p.h.

The truck features positive hydraulic power steering, has air actuated aircraft-type disc brakes for low speed and parking duty, and takes advantage of four wheel dynamic braking. Circle No. 56.

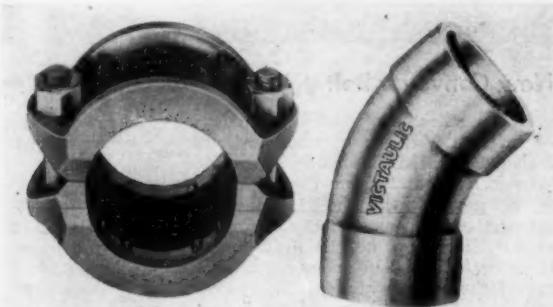


Underground Truck Features Solid Tires

The above Diesel-powered ore carrier is the Model CD-4-T, developed by Getman Bros., and has a low silhouette. It is designed for underground haulage duty. The unit has a 10-ton carrying capacity, and is equipped with planetary drive axle assembly, automatic transmission and mine cushion tires.

The mine cushion tire is a solid type said to have very nearly the same flexibility as a pneumatic tire and traction that is equal to or better than a pneumatic tire. For mining use the tire is claimed to have a considerably longer life than air-filled tires.

The truck has been approved for underground use by the United States Bureau of Mines and belongs to a family of ore carriers widely used in U. S. Circle No. 60.



New Fittings Connect Plain-End Pipes

New Plainlock couplings and fittings are designed with two bolts for fast, easy installation and are fitted with hardened stainless steel grips that engage plain or beveled pipe ends and securely lock them together. Victaulic Company of America assures leak-tightness of the new method and long life under severe service conditions.

Reportedly this is the first time that a complete package of couplings and fittings for plain end pipe has been offered over two inches in size. Big advantage of the system is that no pipe end preparation of any kind is required, and this can save costs on both major installations or small jobs.

Plainlock fittings are available in 1, 2, 2½, 3, 4, and 6-inch sizes from Victaulic Company of America. Circle No. 61.



Crawler Mounted Rotary Drilling Rig

New rotary drill is a completely self-contained unit with a capacity for deep blastholes. It is the Model C42, made by Schramm, Inc., and all drill equipment, air compressor and a capacity of 60 feet of drill steel are all included on the single self-propelled crawler.

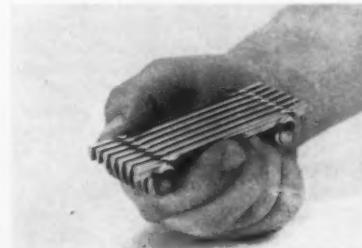
The rig is designed for one man operation. Controls are placed in front of a sulky seat which is mounted on the crawler at the drilling station. The operator can drill to a depth of 20 feet without leaving the seat. A "Lazy Susan" drill steel rack mounted on the mast holds two additional lengths of steel for deep holes.

The compressor produces 250 cfm of free air at 100 psi. Hydraulic power for rotation head is another feature of the unit. Circle No. 62.



New Conveyor Belt

New incline conveyor belt consists of inverted V-ridges of wear resistant Dulton. The belting is made by Boston Woven Hose & Rubber Company and is recommended by the company for carrying objects up an incline as steep as 45°. The new belt is available in three or four ply 28 ounce duck. It is manufactured and stocked in 48-inch wide rolls 500 feet long and can be cut to other widths. Unit has been test proven. Circle No. 64.



Self Cleaning Screen

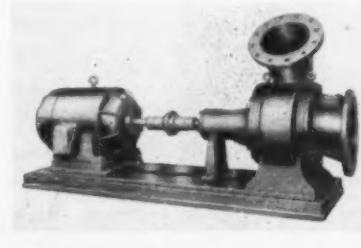
A new wedge-wire screen made of wire with thinner profiles than previously available has been introduced by Cross Perforated Metals, National Standard Company. Known as Rima, the high, narrow profile of the wedge wire is said to permit more wires per area of screen working surface than any other shaped wire screen. Rima screens are made of stainless or carbons steels, and can be furnished in rectangular, oblique angled, round or oval beds. Circle No. 66.



New Three Dimensional Plastic Maps

New three-dimensional views of the United States and the world—showing the shape of the surface as it really is—are now available from the Aero Service Corporation. Both of the vinyl plastic maps, each 28 by 18 inches in size, show full details of land and water. Both maps have mahogany colored plastic frames and are delivered ready to hang. They can be mailed parcel post.

The detailed 50-state United States map shows 4,000 geographic names. It includes 2,000 cities and towns, 1,000 rivers and lakes, 150 National Parks and monuments, and over 200 mountain ranges and peaks. Map scale is one inch to 117 miles. A handy, 26 by 14-inch map index slides out from the back of the map and locates all of the place names shown. Cost of the new maps is \$9.95 each. Circle No. 63.



New Solids Pumps

Gould pumps, Inc. announces the availability of a broad line of heavy duty process pumps with a capacity range up to 9500 gpm and heads up to 220 feet. The pumps are of the end suction, vertically split type, featuring back pull-out assembly which gives ready accessibility to all rotating parts without disturbing pipe connections. All pumps have 45° self-venting discharge connections and either top horizontal or vertical-up discharge is available. Circle No. 65.

Automatic Skip Loader Features Fail-Safe Operation, Minimum Spillage

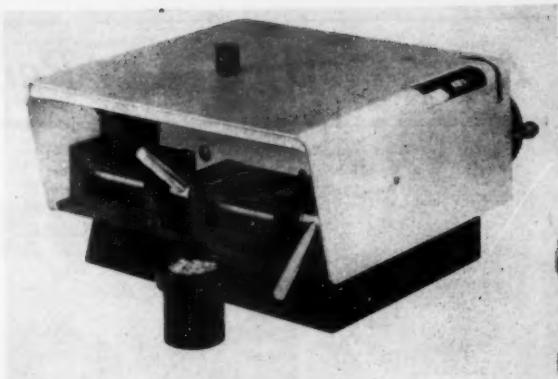
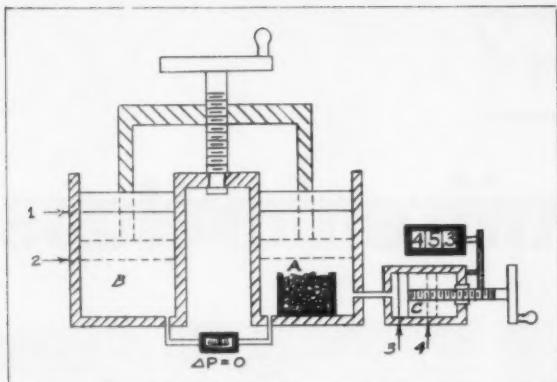
New type of automatic skip loaders, designed and manufactured by Lake Shore, Inc., were recently installed at one of the newest and most automated underground iron mines in the Lake Superior District. The skip loaders operate similarly to the famed "Jeto" skip.

The new skip loader units, complete with bails, are guided horizontally by

fixed steel and supported on load transducers and differential transformers mounted in a watertight heated enclosure. The discharge opening from the storage bins above each loader are equipped with two independently operated radial gates. When the "Jeto" measuring pocket has received a predetermined partial load, the load transducer

provides a signal which will close one of the gates. When total load rate is reached the second gate closes.

When the skip reaches the load position, a magnetic proximity switch investigates the operation of the programmer. Safety catches retract and the main cylinder rotates the pocket and load is discharged to the skip. Circle No. 59.



New Instrument Measures and Indicates True Volume of Porous Solids

A new instrument allows quick determination of the true volume as well as the density, specific gravity or porosity of solid materials regardless of the shape of the particles or the fineness of grind. Developed by Houston Instrument Corp., the instrument is based on the principle that two closed systems of air at the same pressure and temperature will have identical specific volumes. The unit pro-

vides direct digital indication of the true or absolute volume of any solid substance by means of a short procedure.

The diagram illustrates the principle. Sample is inserted in Chamber A which is identical to Cylinder B. Both Cylinder A and B are stroked by pistons which move from Position 1 to Position 2. An unequal pressure then exists in the two cylinders because of the difference in

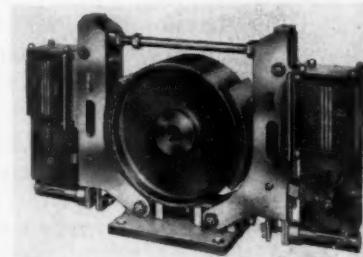
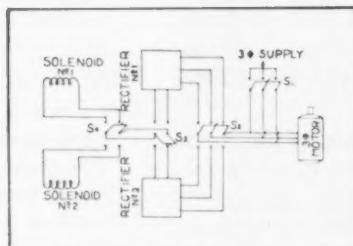
volume caused by the sample. Cylinder C is stroked until the pressure is equalized between Cylinder A and B. The volume stroked by Cylinder C is exactly proportional to the unknown volume of the sample. This volume is read directly on the counter.

Availability of the Model 200 Pycnometer is 30 days. The price is \$450, F.O.B. Houston, Texas. Circle No. 72.

Spare Solenoid Designed Into New Mine Hoist Braking System

New double acting solenoid brake for mine hoists is reported to completely eliminate down time due to solenoid failure. The unit has been recently introduced by Trombetta Solenoid Corp., and is available in wheel diameters ranging from 18 to 72 inches and a torque capacity from 1400 foot-pounds to 75,000 foot-pounds.

The newly developed unit is operated by two separate and independent solenoids. Either solenoid unit is capable of releasing the brake without the help of the other. If a breakdown occurs because of solenoid failure, the alternate solenoid takes over instantly so work can be resumed in seconds reports the manufacturer. The work operation flows unhampered by unnecessary solenoid replacement stoppages. The defective solenoid



can be replaced while the hoist is operating.

Trombetta reports that a unit can be installed on a \$250,000 to \$500,000 mine hoist for a fraction of one percent of the hoist cost. The brakes are operated by rectified direct current with each operat-

ing unit having its own rectifier. The wiring diagram shows the connection system used to facilitate the transferring of the solenoids and rectifiers, so that either one of the rectifiers may be used to excite either one of the solenoids. Circle No. 70.



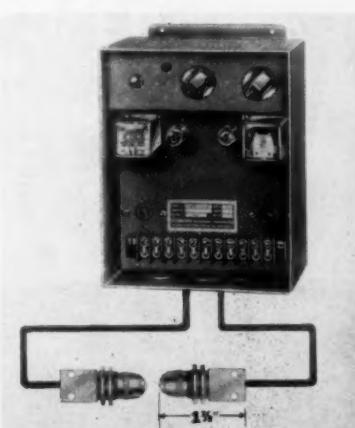
Hard-Surfacing With Paste

Screw conveyor life has been increased approximately 550 percent by application of a fused overlay of Colmonoy. Sweat-On Paste reports Wall Colmonoy

Corporation. The Sweat-On Paste, a suspension of pure chromium boride crystals in a suitable vehicle, is applied in a thin coat and allowed to air-dry. Then it is fused to the base metal by applying an oxy-acetylene flame to the paste-coated surface. The result is said to be similar to hardfacing. Circle No. 74.

Photo-Electric Controls

New photoelectric controls are designed for automatic industrial inspection, counting and control, according to Standard Instrument Corporation. Among operations performed by the "Robot-Eye" are production counting, sorting, inspecting, traffic control, machine and operator safeguard, liquid level and bin control. Circle No. 67.



CF&I-Wickwire develops

DOUBLE

**New wire drawing technique gives
you longer-lasting wire rope**

CF&I-Wickwire's premium wire rope—Double Gray—has now been improved by a remarkable new wire drawing technique. This new wire rope—Double Gray-X—provides EXTRA LONG LIFE.

Wickwire's advanced wire drawing process is the joint effort of our research engineers, metallurgists and key production people. They sought to reduce the friction between the wires within the rope itself, thus producing a wire rope with greater resistance to bending fatigue. An important step in Wickwire's new wire drawing process is the use of *molybdenum disulphide*.

"Moly Disulphide" builds a thin, permanent molecular shield around each wire. Coupled with Wickwire's other advanced wire processing techniques, it gives these results:

- *Friction-free interaction of the individual wires in every strand of Double Gray-X*—A molecular jacket of Moly Disulphide on each wire helps cushion them against the effects of bending, crushing and abrasion. As the rope operates over sheaves, for example, the molecular shield tends to prevent the wire surfaces from grinding against each other, reducing friction and wear.



a superior wire rope

GRAY-X

- *Smoother surface to the wires*—In any wire, tiny imperfections occasionally form on the surface. These "weak links" can cause premature breaking of the wires and impair the life of the rope. Moly Disulphide helps eliminate any minute nicks, creating smoother-surfaced wires.
- *Higher degree of toughness which is essential to longer wire rope life*—Moly Disulphide greatly minimizes the friction involved in the drawing operation, thus preventing the wires from "heating up". This assures the correct physical properties for every wire in Double Gray-X and helps the wire retain its original toughness.

Double Gray-X will be made in a wide range of sizes and constructions to give greater operating economy and reduced downtime for all types of rope-using equipment. It will be available soon from CF&I-Wickwire's chain of warehouses and through a network of nationwide distributors.

EXTRA STRENGTH

In addition to longer life, Double Gray-X gives you the extra strength of Double Gray Wire Rope. Made of extra improved plow steel with an Independent Wire Rope Core, this rope gives 15% higher breaking strength than the catalog breaking strength of an improved plow steel rope with IWRC.

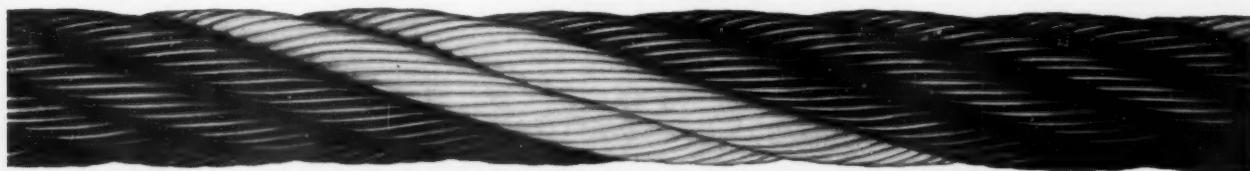
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New Orleans • New York • Philadelphia



MEN WHO MAKE NEWS IN U.S.



A. V. QUINE



R. W. PETERSON



CLARK L. WILSON



H. G. PEACOCK



FRANCIS CAMERON



S. S. ARENTZ

Albert V. Quine, former general manager of Lucky Mc Uranium Corporation, has been named assistant to the vice president and manager, mining division of Utah Construction & Mining Company, San Francisco, California. Lucky Mc, which held extensive uranium mining and milling properties in the Gas Hills region of Wyoming, was recently merged with Utah Construction. Mr. Quine has been with Lucky Mc since 1945.

Richard W. Peterson, chief mining engineer, M. A. Hanna Company, Iron River, Michigan is author of the article on sinking the Homer-Wauseca shaft on page 33 of this issue. He has worked for Hanna since 1951 as mining engineer, underground foreman, and chief mining engineer. He graduate from the Michigan College of Mining and Technology in 1949.

George L. Lyle, Jr. has been named chief engineer at American Cyanamid Company's Brewster, Florida plant. Mr. Lyle, formerly assistant chief engineer, succeeds **W. J. Pace**, who retired after 15 years service with the firm.

Frank S. Block, supervisory chemical engineer at the Department of the Interior's Bureau of Mines Albany, Oregon Metallurgy Research Center, has been named winner of the Arthur S. Flemming Award, given each year to outstanding young men in the federal government. Nominated by the Department in recognition of his achievements in metallurgical research, Mr. Block is the third Bureau of Mines employee in as many years to be so honored.

Harry A. Shaw, former assistant to the general manager of the White Pine Copper Company, White Pine, Michigan, has been named superintendent of the El Paso, Texas electrolytic refinery of Phelps-Dodge Corporation.

Carl G. Hogberg has been appointed president of Michigan Limestone Division of United States Steel Corporation to succeed **Christian F. Beukema**, recently named president of U. S. Steel's Oliver Iron Mining Division. Mr. Hogberg started with U. S. Steel in 1935 as a blast furnace apprentice at South Chicago Works.

Houston N. Clark, formerly assistant to the president, has been named vice president in charge of production of the Potash Company of America, Carlsbad, New Mexico. In this position, Mr. Clark will succeed **Russell G. Haworth**, who has resigned.

Clark L. Wilson, presently vice president of New Park Mining Company, Keetley, Utah, has assumed the chairmanship of the Emergency Lead-Zinc Committee with headquarters in Washington, D. C. In this position, he succeeds **Miles P. Romney**.

Hollis G. Peacock has been named chief geologist with Utah Construction and Mining Company, San Francisco, California. Since 1958, Peacock has been an independent oil consultant with offices in Midland, Texas. Previously, he was with United States Smelting, Refining & Mining Company.

John C. Kinnear, Jr. of McGill, Nevada, heads the list of new officers elected by the Nevada Mining Association recently. **J. C. Kinnear** is honorary president; **Robert O. Jones** of Gabbs, Nevada is first vice president; **Roy A. Hardy** of Reno, second vice president, and **Louis D. Gordon** of Reno, executive secretary. Members of the board of directors, in addition to the officers, are **Henry S. Curtis**, **William L. Kendrick** and **John C. MacDonald** all of Henderson; **A. E. Miller** of Weed Heights; **H. P. Willard** of Gabbs, and **S. H. Williston** of McDermitt.

Dr. John S. Brown, former chief geologist of St. Joseph Lead Company, has been selected by the Society of Economic Geologists to receive its highest honor, the Penrose Medal. Awarded at the Society's annual dinner held in New York during the AIME meeting in February, the medal is given for unusual original work in the earth sciences, and has been awarded only 14 times in the last 36 years. Dr. Brown retired last October.

Richard C. Bowen has joined the staff of the Oregon Department of Geology and Mineral Industries in Portland. A graduate of the University of Oregon, where he received his master's degree in 1956, Mr. Bowen was formerly with Sohio Petroleum Company in British Columbia and New Mexico. He is assigned to a field project on copper occurrences where his work will emphasize geochemical investigations.

Dr. Ben H. Parker, president of the Colorado School of Mines board of trustees, has been elected president of the American Association of Petroleum Geologists, to hold the top position in the world's largest geological organization. Mr. Parker earned both his engineering degree and his doctorate at CSM, he later was a faculty member before serving as the school's president from 1946 to 1950.

Francis Cameron has been elected president of St. Joseph Lead Company to succeed **Andrew Fletcher**, who has been named chairman of the board. Mr. Cameron has been associated with St. Joe since 1945, and has been responsible for general supervision of the company's Southeast Missouri mining and milling operations and its exploration programs.

An independent consulting association has been formed by a group of the Intermountain Area's prominent mining and metallurgical consultants, among them: **S. S. Arentz**, former manager of Nevada operations, Combined Metals Reduction Company and Salt Lake City consultant; **Robert R. Porter**, who was developer of flow sheet for Rio Tinto Mining Company's Blind River uranium mill in Canada and consultant to Utah Construction and Mining Company, Gas Hills, Wyoming; **Lockwood W. Ferris**, former president and general manager of Bonneville Ltd., Wendover, and consultant to Israel and South American governments; **J. Fred Johnson**, retired manager of operations, western mining department, American Smelting & Refining Company; **Sidney S. Alderman, Jr.**, former geologist, American Metal Climax Corporation, Salt Lake City, currently associated with Kern County Land Company; **Jack O. Horton**, former general manager, Vitro Minerals Corporation; **Hoitt H. Ellerbeck**, former president of Utco Products, currently operating a manganese mine and mill in Chihuahua, Mexico; and **Frank Anderson**, mine accountant and management official. Association headquarters will be at 520 E. 4th South, Salt Lake City, Utah.

Clifford J. Hicks has been named to succeed the late Roy E. O'Brien as assistant secretary and western field secretary of AIME. Mr. Hicks joined Anaconda Company in 1947 as a junior mining engineer, and has been with that firm in Butte, Montana, most recently as senior geologist at the Kelley mine.

Appointment of **Charles Taylor** as production scheduling foreman heads the list of recent personnel changes in the Bay Mines division, Kennecott Copper Corporation. Mr. Taylor, a director in the credit union, began his employment with the division in 1940. Other appointments are those of **Stanley F. Johnson**, now production foreman; **Clyde McCroskey, Jr.**, party chief in the engineering department; **Claude Cabitto**, power plant foreman; **Arthur Hipp**, dozer and grader foreman; **Arthur Lefler**, air drill and blast foreman, and **Donald Wixam**, truck shop repair foreman.

NOW haul two loads every trip ...with LW TANDEMS

Here's 1960's BIG news: You can now use TWO scrapers with any electric control Tournapull or Speedpull prime-mover! LW has combined its exclusive electric control system (which sends work-

ing power *any* distance with *no* loss of efficiency) with a new universal-swivel hitch, to give earth-moving its first practical-sized *tandems*.



You save three ways

Save on investment: You double your capacity for the price of another scraper and incidental hitch costs. You *save* the price of a second prime-mover.

Save on operating costs: One operator handles both scrapers. Your only extra operating cost is for a few gallons more fuel per shift.

Save on maintenance: Your only extra upkeep costs are nominal. You have no extra engine, no extra transmission, no other major "extra", to care for.

Big operating advantages, too

Less pusher-power needed: Tandem scrapers load one at a time, so you don't need any more pusher-power for *Tandem twin-loads* than you do for a *single* scraper!

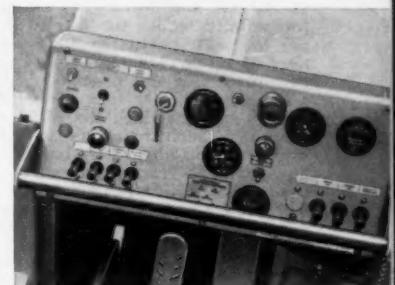
Less haul-road abuse: You'll move more dirt with fewer machines pounding your haul roads. You have less congestion and delay, too.

More adaptability: You can hitch or unhitch the "extra" scraper in less than half an hour, to meet changing job conditions. And you can still interchange your scraper for a Rear-Dump hauler at will!

This universal-swivel hitch securely joins front scraper to rear. Rear-scaper electric leads "plug in" to jack on front scraper. Hitch permits complete maneuverability: you can turn in any direction, back up, perform any other maneuver possible with single scrapers. And there is no jack-knifing at any time.



Left row of fingertip switches control apron, bowl-lift, and tailgate of rear scraper; right row controls front scraper. L "electric" solve problem of operating second scraper by sending power instantaneously, without auxiliary power source, and with no loss on-the-way. Hydraulic and mechanical systems cannot solve this problem efficiently.



LW distributors everywhere are now ready to convert your **present** Tournapulls to tandem operation, or to equip you with **new** 1960 Tournapulls already set for tandem profits. See **your** LW distributor soon, for full details!

Tournapull, Speedpull—Reg. U.S. Pat. Off. TP-2256-DC-1r



LETOURNEAU-WESTINGHOUSE COMPANY, PEORIA, ILLINOIS

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WHAT'S GOING ON IN MINING

Program Highlights of 1960 Western Mining Conference

Among authorities who will discuss the gold situation at the 1960 National Western Mining and Energy Conference in Denver, Colorado this month will be Oscar L. Altman of the Research and Statistics Department of the International Monetary Fund. This year's conference, the 63rd, will be April 21, 22, and 23 in the new Denver Hilton Hotel.

This annual meeting is sponsored by the Colorado Mining Association and affiliated groups.

Dr. A. H. Koschmann will review principal gold deposits in the United States. Other convention highlights are a paper, "Silver—The Precious Metal With a Future," by H. B. Johnson of the Sunshine Mining Company, Wallace, Idaho; data on the expanded research program for lead and zinc by Clark Wilson, Ed Snyder, and Dr. Schrade F. Radtke; and a paper about the use of radioisotopes in

the mineral industry by Fred L. Smith, manager of the mining division of the Colorado School of Mines Research Foundation.

Special papers on uranium mining scheduled include "Underground Mining Methods and Costs at Climax Uranium Company"; "The Use of Computers in Surveying"; "New Haulage Methods"; "Operations of Self-Propelled Down-Hole Shaft Boring Machines" and "Completion of a Circular Concrete Shaft at the Rio de Oro Uranium Mines." Speakers giving these papers include Phil Donnerstag, E. R. Borchert, S. C. Berube and Ray Schultze.

Dr. Charles H. Behre, Jr., of Columbia University will give one of the many geological papers, entitled "Gossans and Their Role as a Guide for Buried Ore Deposits." Speakers in the manganese section include Russell L. Wood, who will explain "Stand-

ard Uranium Corporation's development in San Juan County (Utah)."

James D. Williams of Salt Lake City will discuss "Beryl Developments in Nevada" for those at the beryllium section. A highlight of the mining section will be a paper on "What Tomorrow's Open-Pit Mine Will Look Like," by J. L. Vint, president, Unit Rig and Equipment Company, Tulsa, Oklahoma.

Miles E. Grosvenor, discussing "The Photostress Meter and Its Underground Application" will be one of the speakers in the technical section. A Stearns-Roger Manufacturing Company representative will give a paper on "The Advancement of Mining and Metallurgy," while P. S. Dunn of American Potash and Chemical Corporation will speak on "Advances in the Potash Industry."

The Sowbelly Dinner will be held at the Rainbow Ballroom and the Gold and Silver Banquet at the Hilton, where the Ladies' Party is scheduled Saturday night. The annual Suppliers' Party is to be at the University Club Thursday, April 21.

Mesabi Iron and Reserve Settle Royalty Dispute

Completion of satisfactory negotiations between Mesabi Iron Company and Reserve Mining Company was announced recently by Arnold Hoffman, Mesabi president. Upon approval by Mesabi stockholders, the 1939 agreement with Reserve will be modified and adjustments made on the basis of a straight royalty per ton of iron product shipped, with appropriate escalation provisions.

Starting January 1, 1960 Reserve will pay Mesabi \$1.00 per ton on all iron produced and shipped after that date, based on a content of 61 per cent iron natural, with adjustments for variations.

However, in order to encourage expansion of mining and treatment facilities at Babbitt and Silver Bay, Minnesota, Mesabi will reduce the royalty to \$0.90 per ton with respect to additional production up to 3,000,000 tons in excess of capacity of the present plant, now rated at 6,000,000 tons of pellets annually, and on which the \$1.00 royalty continues. Such reduction will be restored to \$1.00 by yearly increases over a period of 25 years at the rate of \$0.004 per year. For all production above 9,000,000 tons annually, royalty on the excess over this figure will be \$0.85 per ton, but will also be restored to \$1.00 by yearly increases at the rate of \$0.006 per year for 25 years.

American Zinc, Peru Mining Develop New Mexico Project

In the joint zinc exploration venture of Peru Mining Company and American Zinc, Lead and Smelting Company near Deming, New Mexico, assays of drill core samples indicate additional ore reserves. Preparations to begin mining and milling operations are well under way.

The project includes the Kearney, Copper Flat, and Pewabic mines and the selective flotation mill at Deming which Peru had operated for a number of years. Peru's operations had been closed down for three years because of low zinc prices.

Terms of the joint agreement call for American Zinc to acquire a 50 percent interest in the properties for \$800,000 and to spend \$200,000 for exploration, drilling and development before November 1, 1960. If the companies agree the mining of zinc is warranted, American Zinc may spend an additional \$350,000 for further development, start-up costs, facilities and equipment.

St. Joe Expands Smelter To Handle Viburnum Lead

An expansion program that will increase smelter capacity from 100,000 to 150,000 tons of refined lead yearly has been started by St. Joseph Lead Company at its lead smelter in Herculaneum, Missouri. The program includes an additional 9,800-square foot refinery building and two more lead refining kettles, each of 250-ton capacity.

The expansion will bring the smelter in line with increased concentrate production to come from St. Joseph's new and higher-grade mining operation at Viburnum where three mining shafts have now been sunk. Construction of a mill at the Viburnum shaft is near completion and production is scheduled to start in May. The shaft near Dillard has been finished.

After concentration at the mill, the ore will go by truck to the nearest railroad point, 30 miles distant. To facilitate shipment, St. Joseph and the Missouri Pacific Railroad have designed a new railroad car that can carry 60 tons of concentrate in six 10-ton-capacity square steel containers. Loading facilities have been altered for handling the shipments.

The St. Joseph development is expected to result eventually in a town of about 2,000 population, with some 300 persons employed by the company in the Viburnum operation.

St. Joseph is also resuming its zinc production activities, suspended because of market deterioration. Preparations have been made for starting the electric zinc furnace, shut down since July 1957, only one of its type that produces metallic zinc directly from blast furnace slag.

Verde Exploration Plans Arizona Alteration Study

Property in the Jerome mining district, Yavapai County, Arizona, is the subject of proposed study by Verde Exploration, Ltd., which holds 3,400 acres of patented mining claims and controls about 2,000 contiguous acres of unpatented claims. Verde will use an approach that has rarely been intensively applied—the alteration which usually accompanies the deposition of metallic sulphide ore bodies.

Within the last year the company has studied the chloritization of the pre-Cambrian rocks enclosing the two massive sulphide ore bodies in the Jerome district which have produced some 2,000,000,000 pounds of copper, plus gold and silver. Both properties are now closed because all of the known ore has been mined.

According to Arthur Notman, president of Verde Exploration, the conditions in the Jerome area offer a particularly attractive field for application of the alteration concept. However, if efforts prove unsuccessful, he hopes they may develop techniques that can be applied in other mining districts. In the event of encouraging results, diamond drilling will follow.

To start, Verde will study by microscopic and chemical methods the diamond drill cores and hand specimens of older rocks to find diagnostic changes in the chloritization, which should point to the much smaller targets of actual ore bodies in directing drilling operations. The company has some promising clues to start with and a competent crew of specialists to conduct the research.

Although several attempts have been made to interest the mining industry in cooperative research into the alteration concept, several factors have prevented extensive application. The only complete job of its kind that has been done was Dr. Reno H. Sale's study of the alteration of the wall rocks of the copper-bearing veins in Butte, Montana, for the Anaconda Company.



4 reasons why LW graders do more work faster

Here are 4 important reasons why your men will complete more jobs faster with LeTourneau-Westinghouse graders:

1. More full-power gear ratios

LW graders offer 15-speed transmissions; 8 forward, 4 reverse, and 3 optional creepers. With 5 to 9 more full-power gear ratios than other graders, the operator can handle most grading jobs at higher speed. Result: up to 28% more blade work. In addition, top-travel speeds on LW graders are up to 8 kph (5 mph) faster than on most other graders, especially important in saving time getting to-and-from assignments. The 145 and 190-hp POWER-Flow models give you *infinite* speed ranges, with torque converter *automatically* matching speed and power to any load.

2. No horsepower loss thru friction

Because the LW grader's drive train has roller or ball-bearings throughout, it has no horsepower loss through friction. More thrust is therefore made available for pushing bigger loads, for blading deeper, for working faster. Furthermore, with a 100% anti-friction drive, LW grader's fuel consumption per unit of work done is correspondingly lower. In addition, LW's longer bearing life cuts maintenance and

downtime for repairs.

3. Rear-axles carry no weight

LW rear-axles "float" on anti-friction bearings to transfer *full power* to drive wheels. Driving axles are housed in the hollow center of sturdy axle-carriers, which protect them from severe shocks and stresses of rough ground.

Tandems oscillate freely on the two pairs of axle-carriers. Even in roughest terrain, grader keeps all four tandem wheels on the ground . . . driving, pushing, *working all the time*.

4. Easy to operate

LW controls are grouped for "natural" hand-motions to get faster blade positioning. All average blade positions can be obtained from the cab. Blade movement is fast, operator can switch from high bank-cut to deep ditch-cut in less than a minute! Positive-acting hydraulic brakes operate at light touch of convenient pedal. What's more, on LW graders, operator has excellent visibility whether he's sitting or standing! There are 7 LW grader models, 67 to 190-hp. We will send you complete information.

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ARIZONA



Bear Creek Mining Company, exploration subsidiary for **Kennecott Copper Corporation**, has initiated a new exploration program between the Dragon Mountains and Tombstone, Arizona. Approximately six square miles of mining claims have been staked out, according to Dr. Thomas Walthier, district manager for Bear Creek, "in accordance with the routine followed in mineralized exploration." He stressed the point that the company's geological reconnaissance had indicated the possibility of ore in the area, but that no ore deposits had been discovered. A great deal of testing and drilling remains to be done before we will know the property's potential, he said.

Miami Copper Company, Miami, Arizona, is submitting for stockholder approval a plan to transfer its operating assets to **Tennessee Corporation**—subject to a royalty interest in the copper reserves of Miami. The plan also provides for liquidation of Miami Copper Company and distribution of net assets to the shareholders. It is estimated that each share of Miami stock will receive 0.7 of a share of common stock of Tennessee Corporation and approximately \$50 cash. Underground mining at the company's Miami mine ended June 26, 1959. The original Miami mine began operations in 1911 and up to the end of 1958 had produced in excess of 2,300,000,000 pounds of copper. For the balance of 1960 and in the future, the extraction of the remaining recoverable copper will be by in-place leaching and precipitation. Additional Miami production comes from its Castle Dome Division and the Copper Cities Division, both near Miami.

Employees of the **Old Dick** mine of the **Cyprus Mines Corporation**, Bagdad, Arizona, have received a wage increase ranging from 7 to 10 cents per hour, retroactive to February 1. The Old Dick is an underground zinc-copper mine with an operating crew of approximately 75. Curtis Sundeen is mine superintendent.

Mohave Mining and Milling Company has moved its office to the Wells Cargo Building, 264 Chestnut Street, Wickenburg, Arizona, from its previous location on the California Highway. The mining company, now in the process of liquidation, will use the Wells Cargo warehouse and yard for the storage of equipment to be sold.

Keys to Arizona's prehistoric past, of great interest to geologists, are being found in pollen studies made by Dr. Paul S. Martin and his research associates at the **University of Arizona Geochronology Laboratories**. Fossilized pollen extracted from arid land sediments shows presence of horses, mammoths, buffalo, and camels, as well as evidence that there was little climatic change during the last 10,000 years.

The **Arizona Bureau of Mines** has published its seventh county geologic map, this one showing geologic conditions, topography and cultural features in Gila

County. The colored map includes a guide to location of sedimentary, metamorphic and igneous rocks, and a color key showing sources of the geologic data used. The Gila County map, like others in the series, is available at \$0.75 a copy from the Director, **Arizona Bureau of Mines**, The University of Arizona, Tucson.

CALIFORNIA

Milling operations were to be resumed in March by the **Siskon Corporation** in Siskiyou County, California, after a temporary winter closing. Production of gold and silver at the Siskon mine has exceeded \$3,000,000 since 1953, when milling operations began. In its search for unknown ore zones the company has been advised to continue its current drilling program seeking to extend the Virginia ore body and a possible northward projection of the Tennessee ore body, with drilling on the Florida branch postponed. The present surface bulldozing program should be extended to that area of the green schist-phyllite contact lying between the Tennessee pit and the Dogleg.

Yuba Consolidated Industries Inc. operated four dredges near Hammonton, which last year dredged 16,642,265 cubic yards, having an average gold content of 0.1656 per yard. Reserves in the area are about 93,000,000 cubic yards. There are also about 235,000,000 cubic yards of gold bearing gravel in the field, but at depths beyond existing equipment. The company's mining properties comprise some 9,600 contiguous acres in the Yuba River of which 2,000 acres are held under unpatented placer mining claims and 600 acres are leased.

Immediate construction of the first unit of a 1,000-ton-per-day asbestos mill in Napa, California, is planned by the **Clute Corporation**, headquartered in Littleton, Colorado. The initial unit, of 250-ton-daily capacity, should be ready for production runs within four to five months. Part of a \$1,000,000 expansion at the open pit mine site of **Asbestos Bonding Corporation**, Clute subsidiary, the new mill follows operation of a pilot mill that has treated about 60 to 70 tons of asbestos ore a day for the last year. The Clute firm, through its ABC division, holds a 99-year fee lease on the ore body, containing short fiber chrysotile asbestos.

NEVADA

Manganese, Inc. of Henderson, Nevada mined 81,067 dry tons of ore during 1959. Concentrate produced totalled 71,398 dry tons and nodules produced were 49,834 long tons. Total stripping figure for the year was 577,573 cubic yards, and total ore fed to the mill, 290,017 dry tons. During the first quarter the company operated on stockpiled ore and in March began treating a waste pile which ran about 9.5 percent Mn. This year's plans

are to continue operations on ore from the waste pile and to mine underground ore adjacent to the new pit, as well as stripping and mining low grade ore from the original "A" pit.

Production from the owned and leased mines of **United States Milling and Minerals Corporation** of Silver Peak, Nevada has been running at the rate of about 3,000 tons per month and will be substantially increased with the acceleration of current development work. Expansion plans include adding to the Silver Peak mill a cyanide regeneration system which could cut milling costs by \$2.00 a ton. In addition to the **Mohawk**, **Tonopah King**, and **Ohio** mines currently producing, the company has acquired several other properties, including the **Nivloc** mine, at one time the largest silver mine in Nevada. Surveys indicate extensive medium grade ore bodies and preliminary data are being compiled with a view toward reopening the mine on a low-cost, large tonnage basis.

Nevada Mines Division of Kennecott Copper Corporation at McGill is installing a suspended basic arch furnace at its copper smelter, in contrast to the sprung arch type now used. The new design will permit altering the shape of the furnace in several ways and also reduce maintenance, provide a heavier firing rate, and enable repairs to be made while the furnace is in operation.

Non-metallic minerals, particularly pumice formations and insulating materials, are being sought in the Caliente, Nevada, vicinity by Carl Black of the **Western Minerals Inc.** of Cantil, California. The corporation is interested in marketing the minerals in California. Those who have any such mineral samples for assay may contact Western Minerals, Inc., Box 31, Cantil, California.

NEW MEXICO



At the Chino Division, **Kennecott Copper Corporation**, near Santa Rita, New Mexico, preliminary excavation has been completed for an inclined skip installation to remove ore and waste from the pit. The 16,000-kilowatt power plant expansion is nearing completion and the precipitation system is being enlarged and improved. Producing low cost precipitate copper is important at this division because of the composition of the waste and the favorable nature of the terrain. During 1960 the company may spend \$4,000,000 in expansion projects at Chino.

Operations of the **Homestake-New Mexico Partners** in New Mexico have been satisfactory during the last year, according to the annual report of **Homestake Mining Company**. Conditions in the Section 32 mine have improved with regard to ore supply and operating conditions. Drainage of the wet ground is continuing and the mine is expected to repay development costs plus a modest profit. The mill operation is successful, both as to cost and recovery of uranium. In the Homestake-Sapin projects, three mines—Section 15, Section 23, and Section 25

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These heavy-duty off-road Tournapull haulers are available in 10, 20, and 31½ metric-ton sizes. These machines turn around in a space shorter than their own length (in ½ of length when bowl is raised). A triple-layered all-steel body withstands the heaviest loading shocks.



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This fully-proven LW truck is built specifically for rugged, high-speed, off-highway hauling. Its many advantages—including deep "V" body, Hydraulair suspension, power-transfer differential—give you highest output at lowest cost. 20, 24.5 and 29.5 metric-ton sizes (22, 27, and 32.5 ton), up to 375 hp.

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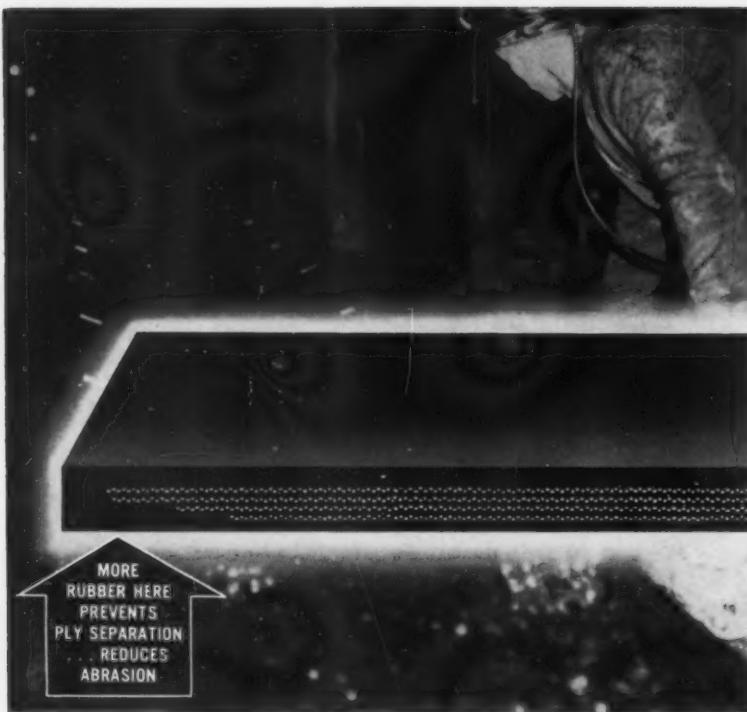
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ROCKY MOUNTAIN

mines—are principal suppliers of ore to the mill with a 1,500-ton-daily capacity. Development and mining from the Section 23 and 25 mines have been relatively slow because of water, so the Section 15 mine has had to produce maximum tonnage. This has led to mining lower grade ore, with consequent reduction in quantity of uranium oxide. On the properties of Lance Corporation, in which Homestake Mining has a 25 percent interest, two ore bodies have been outlined by drilling. Shafts were sunk on both and mining begun late last year.

Ranchers' Exploration and Development Corporation of Albuquerque, New Mexico, has reported on production of ores from uranium properties in Ambrosia Lake operated by three lessees. Phillips Petroleum Company, operating in Sections 28, 34, and 33 (all in T. 14 N., R. 9 W.) produced a total of 75,856.197 tons; Kermac Nuclear Fuels Corporation, in Sections 30 and 33 (T. 14 N., R. 9 W.), produced 50,376.63 tons and 30,717.83 tons respectively, and Rare Metals Corporation of America, operating in Section 30, T. 13 N., R. 8 W., produced 3,843.24 tons. During the quarter ended December 31, 1959, severe weather made it difficult to put ores from the Section 30 mine through the Kermac mill.

William Hays, New Mexico state mine inspector, recently warned underground uranium operators in the Grants, New Mexico, area regarding safety practices. The warning followed three recent accidents. Inspector Hays' letter said that "During all drilling and face loading operations, preparatory to blasting, safety jacks or safety stulls shall be used at all times, regardless of condition of ground, except where roof bolts or timers are directly overhead. The jacks or stulls shall be kept in place until the face is ready to blast. The back must then be checked and the jacks or stulls removed in a careful and safe manner. After blasting, all places must be checked for loose or dummy back and ribs, and barred down, before mucking operations begin." Another letter referring to the reuse of roof bolts said that the department considers pulling roof bolts after they have been installed for roof and rib support a very hazardous and unsafe practice, which must cease immediately. The department will not approve the removal of roof bolts from roof or ribs except when they may be recovered by blasting.



The 100-ton-per-day mica grinding mill of Jolex Mica Company, northwest of Fort Collins, Colorado, is nearing completion, reports John W. Uhrich, president. The company will mine on leased properties and purchase mica from individual miners.

A record 38,419 man-hours with only two minor injuries was achieved in 1959 by the Phillipson Level underground repair crew at the Climax, Colorado, mine of Climax Molybdenum Company. The 23-man crew, headed by Fred Ross, has undertaken some of the most hazardous work done underground, according to P. M. Wadsworth, safety director.

A new name, **Standard Metals Corporation**, has been taken by Standard Uranium Corporation to reflect its diversification policy. The company mined and shipped a record total of 128,978 tons of uranium ore during 1959 from its Big Buck mine in Utah's Big Indian district. Standard's income from sales and other sources amounted to \$3,554,864 during the year, an increase of 162 percent over 1958. Standard spent about \$397,665 in development of its American Tunnel near Silverton, Colorado, and anticipates spending another \$850,000 on the 11,000-foot ore haulage tunnel. A substantial amount was also invested in the Shenandoah-Dives mine at Silverton, acquired when Standard took over **Shenandoah Ltd.** The Micawber mill in the Crested Buttes lead-zinc district of Colorado will be reopened this spring, after being closed down last year because of concentrates storage problems.

The Atomic Energy Commission's bonus payment program for initial production of uranium ores from new domestic mines ended March 31, but applications for certification of eligible mining properties will be received up through April 18, 1960 the Grand Junction, Colorado operations office of the **Atomic Energy Commission** announced. No bonus was paid for ore delivered after March 31. Applications for payments for products from certified properties must be received by the Grand Junction office on or before May 31, or within 45 days after certification, whichever is later. Initial production must have been delivered to a qualified buying station or mill by March 31. The bonus program has been in effect since March 1, 1951.

Production at **Idarado Mining Company** operating between Ouray and Telluride, Colorado was at the rate of 30,574 tons a month during 1959. Net income was \$506,472, compared to \$420,265 in 1958. A larger inventory of concentrates resulted from the decreased sales because of strikes.

SOUTH DAKOTA

Highest annual production in 82 years of operation was achieved last year by the **Homestake** gold mine near Lead, South Dakota, which also contributed 85 percent of the year's net income of \$4,415,569 for **Homestake Mining Company**. Gold recovered from the 1,746,244 tons of ore treated amounted to 573,884 ounces. Total value of bullion shipped from the mine during the year was \$20,119,988, including \$103,457 received for 114,311 ounces of silver. The record production was attributed to an increase in the tonnage of ore milled and to slightly higher grade of ore. More efficient overall operation resulted in an increase to 3.41 tons per man shift. Ore reserves at the mine as of January 1 were 13,871,700 tons with an estimated value of \$12.40 per ton, nearly 700,000 tons more than that reported early in 1959. Ore has been found by development below the 5,000 level at the mine, but until more is known about the continuity of individual shoots, no tonnage there will be included

in the reserves. Development is now progressing on the 5,900 and 6,200 levels and a body of ore of better than average grade was intersected by a drift on the 5,900. Drilling indicates it is of significant size. Spots of high grade ore have also been encountered on the 6,200 level.

UTAH

Permission to extend its uranium ore processing contract is being sought from the Atomic Energy Commission by **Vitro Uranium Corporation**, operator of the principal mill serving uranium producers in Utah, Wyoming and Nevada. The firm, a division of Vitro Corporation of America, reportedly proposed to operate its plant in Salt Lake City, Utah, at a rate of 800 tons of ore daily. It is presently rated at 750 tons daily and has a contract that expires March 31, 1962. The mill is the uranium market for ore shipments from the Marysville, Utah district and for part of the Austin, Nevada, ores of **Apex Mineral Corporation**. If the firm and the AEC reach no agreement on contract extension, a number of independent mining operations served by the mill might have to close. During the last 10 years the Vitro plant, which employs 162 people, has converted from phosphate precipitation of the solvent extraction process which permits treatment of a wider range of ores.

The **La Sal** mine in the Big Indian district southeast of Moab, Utah, produced 39,004 tons of ore in 1959 with a grade of 0.46 percent uranium oxide. Development during the year encountered ore beyond the previous estimates. Owner of the property is **La Sal Mining & Development Company**, whose stock is held by Homestake Mining Company. Homestake also holds under the lease the **North Alice** mine in the same district, which last year produced 76,778 tons of ore averaging 0.22 percent uranium oxide. Additional reserves were developed at that mine during 1959.

May 6, 7, and 8 are the dates for this year's Uranium Symposium to be held by the Uranium Section of the **AIME** of Moab, Utah. This fifth consecutive session will feature technical reports on all phases of the uranium industry and technical papers from the petroleum industry.

Yuba Consolidated Industries of San Francisco, California, has acquired **White Canyon Mining Company** of Grand Junction, Colorado, through an exchange of stock. White Canyon owns mining claims, oil and gas leases, and operating uranium mines in San Juan County, Utah. The firm's largest uranium producer is the **Hideout** mine in White Canyon, Utah.

The drifting program on the beryllium project of **Hamlin Exploration & Mining Company** in the Sheeprock Mountains of Utah was delayed because preparation of the portal site and installation of equipment was hindered by severe weather. However progress is proceeding now on a two-shift-per-day basis, averaging 10 feet a day. In mid-February, 225 feet of drifting had been completed from

the portal. Mineralization has been encountered in the tunnel, reports Robert G. Hamlin, vice president.

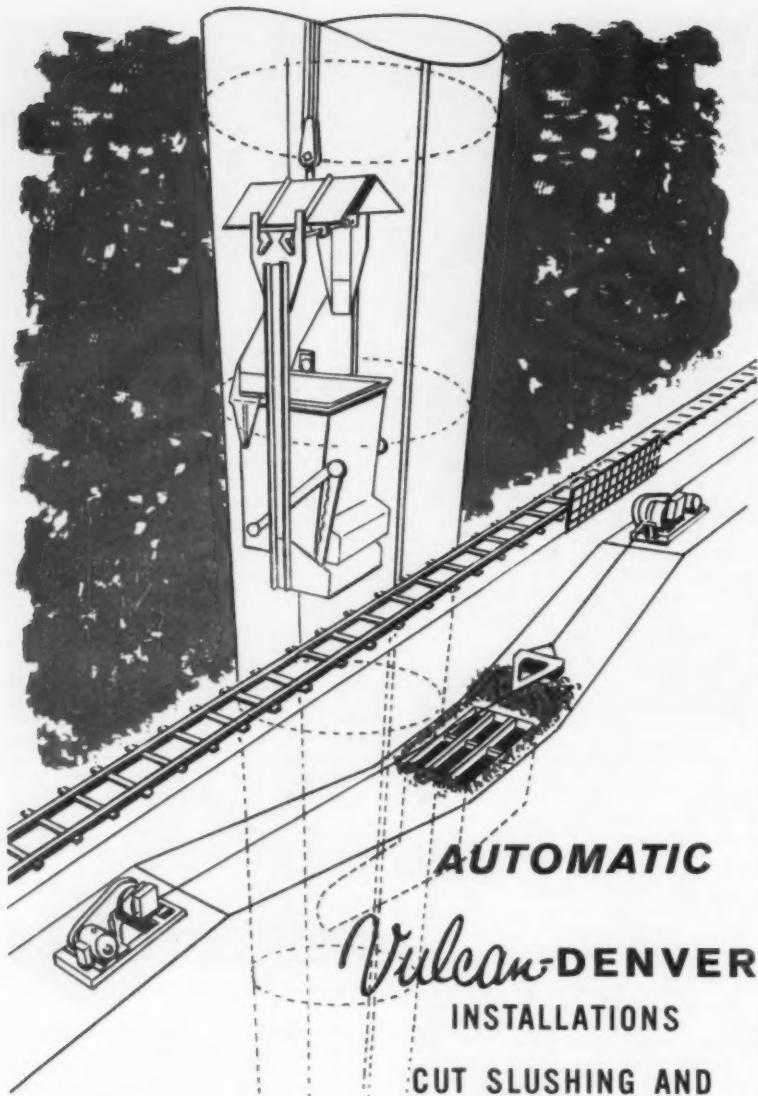
Explorations by **Bear Creek Mining Company** for lead-zinc ores in the Tintic district of Utah have picked up higher values in drilling from a drift due west of the Burgin shaft. Cores were reported to assay nine ounces of silver, 33 percent lead, and 17.8 percent zinc per ton. The drill hole, which went downward and northward at a 60° angle from an existing low-grade ore zone, was drilled 128 feet before ore was encountered, then another 157 feet. Since only some 25 percent of the 157 feet of mineralized core was recovered, not all of the 157 feet was in ore. Southwest of the Burgin shaft where the company was driving a drift off the 1,050-foot level, a "full face" of galena was encountered. Bear Creek, which is the exploration subsidiary of **Kennecott Copper Corporation**, has been prospecting this area under an arrangement with **Tintic Standard Mining Company**, **Chief Consolidated Mining Company** and other mining companies.

Consulting mining and metallurgical engineering services are being offered by **United States Smelting Refining and Mining Company**. According to Oscar A. Glaser, vice president and general manager of western operations at Salt Lake City, Utah, the firm and its affiliates are prepared to handle research problems, particularly in metallurgy, ore dressing, and carbon fuels, and to provide mine operating and mine management services. The company has men available for assignments in plant engineering, mill design, industrial engineering, and geological exploration, he said.

WYOMING

The **Hauber** uranium mine, of **Homestake Mining Company** reached a production level of 8,000 tons monthly in 1959, producing 56,670 tons of ore averaging 0.22 percent uranium oxide during the year. Development has generally confirmed expectations, although dilution resulting from rock conditions, irregularities in mineral distribution, and difficulties created by ground water has kept the grade of ore actually mined somewhat below original estimates. The mine is located on the northwest flanks of the Bear Lodge Mountains in northeastern Wyoming.

Utah Construction and Mining Company has mined the first ore from its new **Christensen** underground mine in the Shirley Basin. This is the first production from the new uranium district east of the Gas Hills in Wyoming. Ore was mined from an upper horizon pierced by the 400-foot deep shaft. Lowering of the water table by pumping a series of churn drill holes is under way so that deeper ore development may be started. Utah will ship this ore to its mill (formerly **Lucky Mc Uranium**) in the Gas Hills under an ore allotment from the **Atomic Energy Commission**. This allotment calls for purchase of 256,000 pounds of U.O₂ annually through March 1962 and 350,000 annually thereafter through 1966. Allen D. Christensen is Utah Construction president.



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CENTRAL AND EASTERN

CENTRAL STATES



A three-day conference on methods of reducing iron ore will be held May 2 to 5 by the Electrothermics and Metallurgy Division of the Electrochemical Society at the LaSalle Hotel in Chicago, Illinois. The conference will consist of 21 thirty-minute papers from seven countries, together with ample time for discussion.

A new method of moving fluorspar is being used by **Minerva Oil Company** to transport its products from Cave-in-Rock, Illinois to its new Wellsville, Ohio river-rail-truck terminal. The company employs a crane with a special lifting fork that hoists two-ton pallet loads of bagged spar into place on the floor of a covered barge, where a two-ton fork lift truck double-stacks the bags. The technique is used in reverse at the terminal, located near the Cleveland-Pittsburgh industrial area. Several grades of fluorspar from the **Minerva No. 1** mine and the company's Crystal plant are being moved by this new means, which affords lower freight charges and makes the fluorspar competitive with European products shipped by ocean freight and the St. Lawrence Seaway.

Although slowed by severe weather during February, **Meramec Mining Company** is now progressing steadily on building construction at its mining installation near Pea Ridge in northwestern Washington County, Missouri. Excavations for the main office building and for the frame of a shaft hoist have been completed. Much of the grading work has been completed for the Missouri Pacific railway spur which will also serve the Indian Creek mine of **St. Joseph Lead Company** which, with **Bethlehem Steel Company**, owns Meramec. The \$30,000,000 Pea Ridge project, first announced in 1957, was originally slated to be ready for production in 1962.

A report by Dr. Schrade F. Radtke on the expanded research program of the **Lead Industries Association** was a feature of that group's 1960 meeting held April 6-7 in St. Louis, Missouri. At a joint session with the American Zinc Institute which held its meeting April 7-8, a report on the International Lead and Zinc Study Group was given by C. W. Nichols. Those at the joint session also heard Robert Hendricks of **Consolidated Mining and Smelting Company of Canada, Ltd.** discuss recent developments in world lead and zinc markets.

Production of lead concentrates by **St. Joseph Lead Company** in its own mines in 1959 was 143,167 short tons, while purchased concentrates totalled 8,300 short tons, as compared with 149,624 and 25,102 tons in 1958. Pig lead equivalent of concentrates was 106,678 short tons in 1959, while in 1958 it was 119,489. Zinc concentrates produced from company mines in 1959 amounted to 81,292 short tons, while those purchased totalled 104,493. Comparable figures for 1958 were 99,253 and 84,987 tons. Slab zinc equivalent of produced and purchased concentrates in 1959 was 121,138 short tons, while in 1958 it was 120,515.

Uses for mounting stockpiles of depleted uranium—a byproduct of the enriched uranium produced for the **Atomic Energy Commission**—are the subjects of study at four U. S. Bureau of Mines research centers. Investigations are being carried on at Rolla, Missouri; Boulder City, Nevada; Albany, Oregon, and Laramie, Wyoming. Substantial quantities of the material in the form of uranium hexafluoride are now on hand. Several thousand tons could be made available if government or industry can develop applications for it.

High school seniors and college students are being sought for summer employment by the U. S. Bureau of Mines at Rolla, Missouri. Students in chemistry, metallurgy, and physics will receive training in their chosen specializations. Monthly starting salaries range from \$270 to \$310, and many fringe benefits are included. Further details are available from Raymond Giessing at the Farmington, Missouri, Post Office, or the Executive Secretary, Board of U. S. Civil Service Examiners, Bureau of Mines, Rolla, Missouri.

Three employee groups of **St. Joseph Lead Company** in Missouri set "no lost time" accident records during 1959. These entire organizations, including some 25 units, were Federal No. 6 mine under Asa Lee Cook, Federal mill under Horace R. Starl, and Bonne Terre mill under Kenneth B. Hall.

EASTERN STATES



The title to about 2,700 acres of phosphate land near Bartow, Florida, was transferred recently from **Kentucky Store & Land Company** to **General Phosphate Corporation of Kentucky**. The land was purchased last year for about \$8,500,000 from residents in the Bone Valley phosphate district between Bartow and Fort Meade. **Virginia-Carolina Chemical Corporation** recently began mining on one of the tracts.

All units of the **Michigan Chemical Corporation**'s seawater magnesium oxide plant at Port St. Joe, Florida are now in operation and full production will go to consumers in the refractories industry this year.

Headquarters of **American Metal Climax, Inc.**, are now in a building bearing the company name at 1270 Avenue of the Americas, Rockefeller Center, New York, New York. About 600 employees were involved in the move, from previous New York locations. **American Metal Climax** is active in the minerals extractive field, principally in non-ferrous metals, with diversified interests in the eastern United States, in Michigan, Colorado, New Mexico, and abroad.

Virginia-Carolina Chemical Corporation will extend its land reclamation project by planting citrus trees on some 60 to 70 acres of mined out phosphate land in the Bartow, Florida, area. The firm, which made experimental plantings on two tracts last year, also is considering methods of combining its sand re-

jects with phosphate fines and using the mixture to fill in low areas, leaving deeper depressions as lakes rather than have it in its present swamp-like condition.

Union Carbide Nuclear Company is nearing completion of its nuclear ore and research center located about 40 miles northwest of New York, New York. The **Union Carbide Corporation** subsidiary also has research facilities in Tennessee and Kentucky.

Nearly \$14,000,000 was spent by the **International Minerals and Chemical Corporation** for its expansion program in 1959. The program of plant additions, improvements and expansions included \$2,789,953 for completion of a five-year program at the Bonnie phosphate chemicals plant near Mulberry, Florida, which increased the plant's production capacity to \$20,000,000 in 1958-1959 sales. Another major expenditure was \$6,658,972, supplied to IMC's Canadian subsidiary for its new potash operation near Esterhazy, Saskatchewan.

The Eagle-Picher Company of Cincinnati, Ohio has consolidated operations of its chemical division, and mining and smelting division into a new chemicals and metals division. In addition to roasting concentrates for the mining and smelting unit, the chemical division processes zinc and lead concentrates, and has sold slab zinc, germanium and other rare metals for the mining division.

A 50 percent increase in zinc ore output is planned by **New Jersey Zinc Company** at its **Flat Gap Mine** in Hawkins County, Tennessee, where the output will gradually rise from 2,000 to 3,000 tons per day. The Flat Gap mine set a remarkable record of mining and milling 2,000 tons daily within a year after production first began in January, 1959.

More than \$7,000,000 worth of Florida phosphate rock was purchased by Japan in the 10-month period ending in November, 1959. The **Florida Phosphate Council** has reported figures for that period which show exports to Japan of 1,073,931 tons—an increase over the shipment of 968,500 tons valued at \$6,353,088 during the same period in 1958. Total exports for the 1959 period were 2,635,368 tons valued at \$17,864,458.

An all-time record in production of triple superphosphate equivalent was achieved recently at the Bonnie chemical plant of **International Mineral & Chemicals Corporation**, Bartow, Florida. The month of the production achievement, December 1959, also saw a new low in plant accidents to set a safety record. Comparison figures showed nearly a 25 percent increase in production over the same month in 1958. Volume has been increasing gradually at the plant since a 1958-59 expansion program.

IRON RANGES



Pittsburgh Steel Company has added to its iron ore holdings in Minnesota and joined a Canadian ore development

project in a move to cut its raw material costs. In Minnesota, the firm bought out interests which **Interlake Iron Corporation** held in **Bennett Mining Company** of Keewatin, to become sole owner, and also acquired a 25 percent interest in **Lake Mining Company** of Biwabik from **Bethlehem Steel Corporation** and **Youngstown Sheet and Tube Company**, Partners in the latter concern are **Interlake Iron Corporation**, **Inland Steel Company** and **Steel Company of Canada Ltd.** Pittsburgh expects to get 250,000 tons of ore yearly from Lake Mining and 500,000 tons a year from the Bennett properties which are expected to be worked out sometime between 1963 and 1965. The Canadian project is a low-grade deposit in the Wabush Lake region of Newfoundland, Canada, in which several United States and Canadian steel firms are involved. Pittsburgh will probably invest some \$6,000,000 in development there during the next five years, and anticipates a yield of 400,000 to 500,000 tons of concentrate yearly when the proposed open-pit mine begins producing in 1965. The Wabush property is described a five-square mile deposit with proven reserves of a billion tons of low-grade ore, which reportedly can be concentrated to an iron content of 64 percent.

A new laboratory at the **Coons-Pacific Company** iron ore beneficiation plant was completed recently and will be operated by **Lerch Brothers, Inc.**, Hibbing, Minnesota iron ore chemists. The laboratory which is two miles southwest of Eveleth, Minnesota on the Mesabi range, replaces previous facilities in Virginia, Minnesota, established by Lerch in 1892.

Exploration for copper in Douglas County, Wisconsin, 50 miles southeast of Superior, have been discontinued by **Cerro de Pasco Corporation** because of discouraging results. However, **Bear Creek Mining Company**, which is exploring in 110,000 acres of county-owned land in that area is engaged in drilling to deeper levels than Cerro de Pasco. Bear Creek is a subsidiary of **Kennecott Copper Corporation**.

Iron mines in Gogebic County, Michigan, operated throughout the entire year of 1959, producing 1,639,892 tons of ore, without a fatality. Production exceeded the previous year by nearly 300,000 tons, despite cessation of mining during the steel strike. Total employment in the year averaged 1,236 men, with the **North Range Mining Company**, operating the Penokee mines at Ironwood, heading the list with 329. Top producer was the Geneva mine in Bessemer township with 396,475 tons. Other mines are the Newport, Peterson, Bessemer and Sunday Lake. In the last 10 years there have been only 12 fatal accidents in the mines of the county.

Pickands Mather & Co., Duluth, Minnesota which received the Joseph A. Holmes award for outstanding safety performances, has also been recognized by the National Safety Council for its record. Certificates of commendation from the Council, given for operating without a disabling injury, have been received by Erie maintenance; Mahoning mine; Hibbing laboratory, Erie Mining Company; Scranton mine, Tioga No. 2 Mine; Danube mine; Zenith mine, and Crete Mining Company. The Erie power plant at Erie Mining Company also was honored for its safety record.

ALASKA



Several mining firms have reportedly expressed interest in the Hayes Glacier molybdenum property, west of Anchorage, Alaska, discovered recently by John Baker and others. It was reported that a considerable amount of prospecting is justified by the size and grade of the showings on the surface, according to Charles Herbert, Anchorage mining consultant.

Newmont Mining Corporation initiated exploration during 1959 in some areas of Alaska that seem favorable for base metal occurrences, and is continuing the program this year. Newmont, which has mining interests in the United States, Africa, and the Philippines, has leased an Alaskan nickel-copper prospect on which exploratory drilling is planned.

The lower Chena Valley along the Fairbanks-Chena Hot Springs road now being built is the subject of two reports available from the **United States Geological Survey**. The bedrock and superficial geology of about 320 square miles along the Chena River between its confluence with Chena Slough and with the South Fork is given in the publications, which contain maps, tables and data on permafrost and seasonal frost. The western part of this area is already accessible and completion of the new road will bring increased settlement and activity. Copies of the reports may be inspected in Alaska at offices of the Geological Survey and the State Division of Mines and Minerals. Copies may be bought by mail from Survey offices in Fairbanks, Alaska; Denver, Colorado, and Washington, D. C.

An exhibit on the physiographic provinces of Alaska, representing the most comprehensive attempt in 50 years to outline its features in that way, was on display at the recent First International Symposium on Arctic Geology held in Calgary, Alberta, Canada. Aerial photographs and modern topographic maps were used in the exhibit which shows 12 provinces, divided into 60 sections on the basis of physiographic characteristics. Several United States Geological Survey geologists and geophysicists took part in

the symposium and presented scientific papers, maps and charts showing research activities in the Arctic. Material exhibited in Calgary will later be available at the Geological Survey library in Menlo Park, California.

IDAHO



Idaho Cliffs, Inc., a subsidiary of The Cleveland-Cliffs Iron Company of Cleveland, Ohio, has taken options on the Joe Ausich property near Mackay, Custer County, Idaho, and the adjoining W. P. Barton property. Geophysical and mapping work has been done and core drilling is scheduled to follow.

Installation of some new mining machinery and additional development work is planned by **Clearwater Mines, Inc.**, at its Niagara Creek property in northern Idaho, when operations are to be resumed as soon as road conditions permit. The company has 12 patented claims and six unpatented claims in Shoshone County, about 35 miles south of Superior, Montana. Last summer the group improved seven miles of private road to the claims and built living quarters for workers. The main tunnel was reopened and timbered. About 2,000 tons of ore were stockpiled with an estimated grade of about 7 percent copper with traces of silver and gold. H. G. Loop of Spokane, Washington, is president and general manager.

Start of production at the new \$2,000,000 Kellogg, Idaho, phosphoric acid plant of the **Bunker Mill Company** is anticipated about July 1. The company's electrolytic zinc plant in Kellogg is again on five-unit production after a period of four-unit operation. Bunker Hill profits for the last quarter of 1959 were \$499,134, offsetting losses in the second and third quarters to total \$322,458 for the year and attributed mainly to the increase in the combined lead-zinc price. In 1958 the company had an overall loss of more than \$2,000,000. In 1959 the company mines produced 41,745 tons of lead, while smelter production was 94,084 tons. Zinc from company mines was 32,897 tons and refined zinc production totalled 61,191 tons. Sales of sulfuric acid during the year amounted to 100,581 tons.

The **Lucky Friday** mine surface plant has been improved and enlarged to take care of expanded mine output. Construction includes a new miners' change house, machine shop, warehouse, substation and mine office, a sand fill system utilizing mill waste for stope fill, and a conveyor system capable of transporting 200 tons of ore or waste rock hourly from underground pockets at the shaft collar to mill or dump. All materials handling has been mechanized. Development work on the bottom 3050-foot level of the mine in 1959 added some 550,000 tons of ore to reserves, bringing total estimated reserves to 1,373,132 tons.

Super-pure antimony metal for the manufacture of transistors now is being produced by the **Bunker Hill Company** at Kellogg, Shoshone County, Idaho, through a refining process developed by its research department. Acceptance by industry throughout the world has exceeded company expectations. The antimony is 99.99 to 99.999 percent pure. A. Y. Bethune is manager of metallurgy.

A newly discovered deposit of perlite near Malad in southeastern Idaho is being discussed as the source of a new mining industry in the Oneida County area. A new firm, **United Perlite Corporation**, has been formed and is planning to build a plant at Malad to process the ore used in manufacture of building industry materials. Marion J. Hess, contractor who heads the new company, discovered the perlite when hauling other material from the area. Weight of the ore led him to have it analyzed. Reports indicate the deposit, located 25 miles northwest of Malad, has large reserves.

First output of **Lat.ah** County's newest industry was scheduled to start last month as **J. R. Simplot Company** began operations at its \$1,500,000 clay, mica, and silica plant outside of Bovill, Idaho. The new plant will have a capacity of 60,000 tons of high purity silica and 70,000 tons of clay annually. Simplot, which has headquarters in Boise, Idaho, started exploration about four years ago in the Bovill area, which contains major reserves of clay and sand. Clay deposits, which run to depths of 30 feet, are the only ones of their type known in the western states, according to the company. The plant includes a pipeline to carry water and sand mixtures from the open pit mining area, and a similar line for transporting water-clay slurry will be added later. Two large clay-bottomed settling tanks, 185 feet and 100 feet in diameter, are also part of the operation.

The old **Gold Hill** mine at Quartzburg, Boise County, Idaho has been sold at auction for \$3,500 to W. S. Rodman Jr., Boise. The seller was A. H. Burroughs Jr., Boise, president of **Talache Mines, Inc.**, which purchased the mine in 1927. The mine camp was burned out in 1931. Gold was discovered on the property in 1863 and total production was said to have totaled \$7,500,000.

Pumping out of the old **Bluebird** and **Hidden Treasure** mine shafts in the Elk Mountain district, Kootenai County, Idaho is planned by Edgar W. Oehrling and Arnold W. Mollenhauer of Coeur d'Alene, Idaho who intend to examine lead-silver showings. They did considerable bulldozer stripping on the Elk Mountain tungsten claim last fall and reported that eight veins are exposed.

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Nuclear Fuels and Rare Metals Corporation has leased the Wilcox mill at Salmon, Idaho and plans a \$100,000 remodeling program in anticipation of treating thorium-bearing ores from properties in the Lemhi Pass area, Lemhi County, Idaho. **Sawyer Petroleum, Inc.**, Los Angeles, California has spent about \$125,000 in three years blocking out thorite in the area.

MONTANA

Production is about 1,000 tons of lead-zinc-silver ore monthly at the **Jack Waite** mine on the Montana-Idaho border, Sanders County, Montana. The ore is coming from two stopes in the upper part of the mine. A night shift had to be added recently to keep up production because working faces are getting farther from haulageways. A development crew, meanwhile, is drifting easterly on the Jack Waite fault structure on the 300-foot level. Employment in mine and mill totals 25. The mine is owned by **Jack Waite Mining Company** but operated by **American Smelting and Refining Company**.

Harry Thatcher and Tony Dix, Wallace, Idaho, have been driving about six feet of crosscut daily under a contract at the **Nancy Lee** silver-copper-lead mine near Superior, Mineral County, Montana. E. G. Smith, Osburn, Idaho, has leased the mine from **Nancy Lee Mines, Inc.**, Kellogg, Idaho.

Montana Phosphate Products Company, in 1959, shipped 293,000 long tons of ore from its phosphate mines located near Avon, northeast of Garrison and near Phosphate Siding, Montana. Shipments were made between March and November, with rock loaded at Avon amounting to 1,059 carloads, produced by the **Luke** mine. Other ore came from stripping operations and from the underground **Anderson** mine, which has existed since the 1930's. The **Brock** mine is still under development. The Montana company, a subsidiary of **The Consolidating Mining and Smelting Company of Canada, Ltd.**, has shipped 1,278,000 long tons of phosphate ore since 1955, when it began a \$1,500,000 improvement program. Most of the ore goes to Canada, some to the **Victor Chemical Company** in Silver Bow, Montana.

Following settlement of the long **Mine-Mill Union Workers** strike at **Anaconda Company** in Montana, the **Kelley** and the **Mountain Con** mines were readied for production immediately. Production was also to be resumed at the **Berkeley** pit, as well as stripping at the **Alice** Pit. Some development work was scheduled initially for the **Steward** mine and at the **Elm-Orlu** Black Rock low grade zinc project. The **Emma** mine, a manganese producer, and the **Anselmo** zinc mine were not to be reopened immediately.

The **Easton-Pacific & Riverside Mining Company**, formed last year, is developing the old **Easton-Pacific** mine near Virginia City, Montana. A long tunnel which tapped the ore bodies at depth has been reopened and crews are now drifting on gold-bearing quartz veins.

NORTHWEST

WASHINGTON

Dawn Mining Company processed 160,005 tons of uranium ore during 1959 at its Ford, Washington, mill. The ore was valued at \$6,168,102, making uranium the most important metallic mineral now being produced in the state of Washington. The value of 1959 zinc production, in second place, was \$3,867,000. Bulk of the uranium was mined at Dawn's **Midnite** mine north of Welplint in the Spokane Indian Reservation. Custom ore receipts totaled only 33,862 tons. Development drilling added substantially to proven ore reserves during the year. J. A. Pike, Spokane, is manager.

Open-pit mining at Washington's only iron mine—the **Kulzer** near Valley in Stevens County—has been resumed following a cold weather shutdown. Production in 1959 totaled 5,000 tons of hematite which was sold to **Ideal Cement Company** in Spokane. The ore occurs in pockets and overburden is removed to depths up to 75 feet with a bulldozer. C. C. Hill, Spokane, operates the property under lease.

Resumption of work at the **Huffman** lease in the Mount Spokane uranium district, northern Spokane County, is planned this spring by **Spokane National Mines, Inc.** Operations were halted in January by freezing temperatures after 150 tons of ore had been stockpiled.

Exploratory diamond drilling is to be resumed this spring at the lead-silver-copper property of **Crystal City Mining Company** near Miles, Lincoln County, Washington, according to present plans. Last drilling, in 1957, yielded encouraging results. The new work will be from the 100- and 200-foot levels to probe downward extensions of ore shoots mined many years ago. An electric power line was extended to the mine last summer and the former Diesel plant will be replaced by an electrically powered air compressor. The company has finished paying for the property. Luke Williams, Greenacres, is president and Thomas W. Staudacher, Spokane, secretary-treasurer.

Utahcan, Inc., is sinking on a vein of high grade lead-silver ore uncovered last fall in bulldozing a new road on its property in the **Jim Creek** District, near Lone, Pend Oreille County, Washington. A test shipment of ore was made to the **Bunker Hill** smelter in Kellogg, Idaho. Concentrating of milling-grade ore, started last fall, was stopped by a ball mill breakdown and a frozen water supply but is to be resumed this spring when weather conditions permitted. Equipment to remove iron from the zinc concentrate may be installed before milling is resumed. Roy Lorang, Spokane, is president.

Nearly 400 men are employed at the **Mead**, Washington, ferro-alloys plant of **Pacific Northwest Alloys Company** which reactivated a second furnace early this year. This is nearly double the number employed just prior to last summer's steel strike and production is about 25 percent higher.



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Strata Control Conference Scheduled for May in Paris

The study of rock pressures in underground faces and in haulage ways leading to the faces is the theme of the International Strata Control Conference to be held May 16 to 20 in Paris, France. Sessions will be held at the Centre Marcelin Berthelot (Maison de la Chimie), 28 bis, rue Saint-Dominique, Paris-7e.

Subject for the first afternoon session Monday, May 16, will be "Supports", and for Tuesday, "Studies on Small-Scale Models" and "Rock Characteristics". May 18, those attending the meeting will hear papers on "Underground Measuring Methods and Equipment", and "Observations and Measurements in Roadways".

Topics for the last two days are "Observations and Measurements in Faces", "Influence of the Method of Working on the Behavior of the Strata-Rock Bursts" and "Development and Trends in Roof Control".

Among those who will present papers at the conference are H. G. Denkhaus and F. G. Hill, discussing conditions of the ground around excavations in hard rock at great depth.

Broken Hill Will Develop

Koolan Island Iron Deposit

Iron ore deposits on Koolan Island, Yampi Sound, near Cockatoo Island in Western Australia will be developed by Broken Hill Pty. Company Ltd., at a cost of some £6,300,000. Extensive geological prospecting and diamond drilling on the island indicate that 2,000,000 tons of ore per year can be recovered.

Some time ago the Western Australian government had reportedly negotiated with Broken Hill about development of these deposits to supply an integrated industry for this state. The state government also wishes, however, to have iron

ore exported to Japan for funds to develop further the charcoal-iron industry at Wundowie. Final decision rests with the federal government, which is expected to allow limited iron ore exports this year.

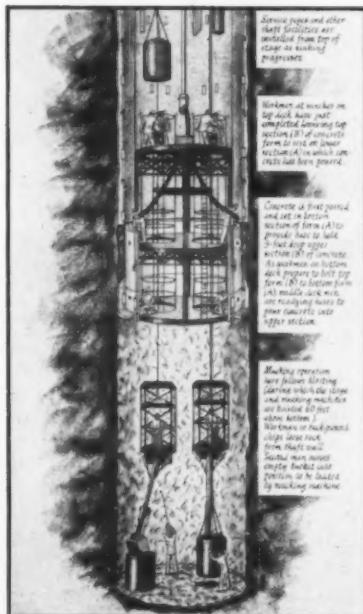
The state government, accordingly, has asked for bids for mining of iron ore. Western Mining Corporation and Great Western Consolidated N. L. have submitted a joint bid to mine a deposit at Dowd's Hill, 28 miles east of Copperhead. Rio Tinto interests have also bid for iron ore mining at Mount Goldsworthy, in the Pilbara mineral field.



QUEBEC — Most active exploration area in Canada during the coming field season will probably be the Montbray-Dupratis Townships area northwest of Noranda, Quebec, where property has been acquired recently by Kerr-Addison Gold Mines Ltd., Noranda Mines Ltd., Southwest Potash Corporation and Chesseriville Mines Ltd. Interest in the area, which has been active on previous occasions, was created by a newly-formed geological theory that all known major copper-gold mineralization deposits in the area are related to a belt of acid volcanic rocks, mainly rhyolite or rhyolite breccia, representing the rim of a dome-shape remaining after glaciation. Hydra Explorations, Daering Explorers, Latin American Mines and Wiltsey-Coghlan are among companies with exploration plans for the area.

ONTARIO—As a result of the Canadian government's stretch-out program which followed the expiration of United States' uranium purchase contracts, Rio

European Methods to Sink Wet Canadian Shaft



A European mining technique—tubbing—will be used by International Minerals & Chemical Corporation (Canada) Ltd. for sinking its shaft near Esterhazy, Saskatchewan. The 300-foot, 3,000-ton cast iron lining will be used between the 1,200 and 1,500-foot levels of the shaft to wall off water-bearing Blairmore sands. John Bertram & Sons, Dundas, Scotland will supply the lining, designed to insure safety "as long as there's potash in the deposit." The German firm of Haniel & Lueg, mining engineers, will direct installation of the tubing which consists of 65 rings, each five feet high, 18 inches thick, and 18 feet in diameter. Another new device, the triple-deck sinking stage unit pictured here, will speed shaft sinking in the non-water bearing, more competent rock below the sands. The arrangement allows simultaneous activity at three levels in shaft-sinking—mucking, preparation of concrete forms, and pouring of the concrete shaft lining. This marks the first use in the Western Hemisphere for both methods. Utah Construction and Mining Company has the contract for the IMC shaft, for what is called the world's greatest known reserve of high grade potash ore to be processed in the new flotation plant which has virtually been completed adjacent to shaft collar.

Tinto Mining Company of Canada Ltd. is merging all its Algoma district uranium firms into one new company. The new company will be **Rio Algom Mines, Ltd.**, and will consist of **Algoma Uranium Mines, Ltd.**; **Milliken Lake Uranium Mines, Ltd.**, **Northspan Uranium Mines, Ltd.**, and **Pronto Uranium Mines, Ltd.** The four, which have previously produced about 1,000,000 pounds per month, will reduce concentrate output to about 390,000 pounds monthly in order to continue operations until 1966. According to the company it is likely that only the Nordic and Quirke mines of its Elliot Lake group will still be producing uranium by early 1961. It is also probable that the Pronto uranium mill will be converted to production of copper concentrate from the nearby Pater copper ore body. The Pater shaft is being unwatered and a deep drilling program is scheduled.

YUKON TERRITORY—A proposal to establish a national park in the area of the St. Elias Mountain Range in the southwest corner of the Yukon Territory, now known as the Kluane Game Sanctuary, is receiving opposition from the British Columbia and Yukon Chamber of Mines. According to that group, the park could well be detrimental to the economy of the Yukon and adversely affect western Canada's rapidly expanding mineral exploration program, possibly restricting prospecting activity in the area. The group feels that the immediate and potential value of mining in the Yukon is much greater than advantages to be gained from promoting tourist trade in the area and cites present mineral production figures as well as probable future plans for the area.

QUEBEC-Aluminium Ltd. is increasing its aluminum production during the next few months, aiming toward an output of 675,000 tons as its goal in 1960, or 87 percent of capacity. In December, the company had announced that its annual rate would be 595,000 tons. Total output for 1959 at Canadian plants was 520,000 tons, while sales for the year were 635,000 tons, an increase of 10 percent over 1958. According to N. V. Davis, president, the increased production in Canada, plus the output from Aluminium's overseas subsidiaries and other sources, should permit the company to fill present commitments and retain reasonable stocks on hand.

ONTARIO—Output of nickel by Falconbridge Nickel Mines Ltd. last year reached a record amount, 59,000,000 pounds, an increase of 10,500,000 pounds in a year. With its new smelter equipment and expanded mine workings, the northern Ontario company has a potential capacity of about 65,000,000 pounds yearly, according to Horace Fraser, president.

BRITISH COLUMBIA—During the fourth quarter of 1959 **Bralorne Pioneer Mines Ltd.** continued exploration and development with encouraging results. Drift development, limited to the 79 vein on 30 and 33 levels, confirmed the presence of a short, but good grade, deep ore body extending from 24 level to below 34 level and in such a position that its mining will also provide a down-cast air passage for ventilation of the deep and substantial 77 vein reserves. Sinking

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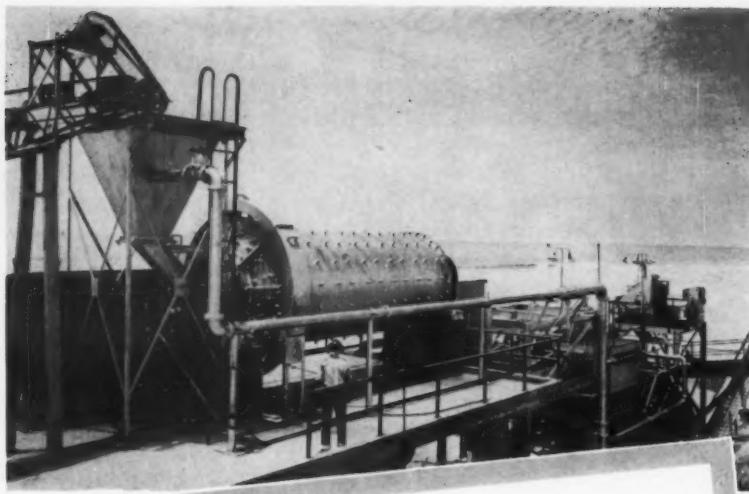
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of the Queen shaft is now 90 feet below the 37 level station. Development at Pioneer consisted of completing the sinking of No. 5 shaft to 30 level, completing the crosscut to the 27 vein and preparing to drift southerly on the ore structure. The company has secured a working option on the Ace Mining Company property about 12 miles from the Bralorne mines, consisting of the former Congress mine and adjoining claims on which a small, but rich, gold discovery was made recently. Some underground development was done at the Congress mine many years ago when several hundred thousand tons of low-grade gold and medium-grade antimony ore were developed.

ONTARIO—Bigwood township on the north side of the French River South of Sudbury, and an adjacent part of Fifteen Mile Island in Parry Sound District, are shown on a new geological map available free from the Ontario Department of Mines. The map, No. 1960F, was prepared as part of a program of examination of nepheline syenite deposits in this province. Two large bodies of this mineral occur in the area mapped. Other mineral occurrences include quartzite, corundum, graphite, allanite and radioactive minerals.

BRITISH COLUMBIA—Mining operations have been resumed at the Wonderful mine of Silver Ridge Mining Company, Ltd., in the Sandon district. Silver-lead ore is being milled at Sandon and concentrates shipped to the Trail smelter. H. F. Magnuson, Wallace, Idaho, is president, and F. C. Robinson, Nelson, secretary-treasurer.

ONTARIO—An aeromagnetic map and a geological report on the Wapesi Lake-Tully Lake area were released recently by the Ontario Department of Mines. The map, called the West Red Lake Sheet, is on a scale of one inch to a mile and covers an area approximately 400 square miles, west of Longitude 94° W., including townships of Ball, Todd, Mulcahy, and Killala. The map is available at 50 cents per copy through the publications branch of the department in Toronto. The report deals with an area of about 1,200 square miles north of Sioux Lookout and southeast of Red Lake. Lithium finds in the Root Lake area north of Tully Lake caused early interest in the area, but no lithium was reported in the area covered by this publication. A colored geological map accompanies the report, written by W. R. M. Williamson and P. P. Hudec.

ONTARIO—A new mechanically propelled raise driving platform has been developed by The Craig Bit Company at its plant at North Bay, Ontario. Believed to have a market in all types of Canadian mining, the machine is the company's first departure from the basic rock drilling products of the firm, which is continuing its emphasis on research and product development.

QUEBEC—Canadian Johns-Manville is continuing its quality improvement program at the mill of its Jeffrey mine at Asbestos, Quebec. At the mine, the company is further expanding and extending its open-pit mining and has continued with stripping of overburden from a new area to be mined. After completion of this program in about two years, under-

INTERNATIONAL

ground mining will be discontinued and substantial savings effected in mining. At the **Advocate** asbestos ore body in northern Newfoundland, exploration, test mining, and core drilling continue. A small pilot mill was built and final evaluation work is expected to be completed this year.

BRITISH COLUMBIA—A safety record matched by few Canadian mines was achieved by the H. B. mine of the **Consolidated Mining and Smelting Company of Canada Ltd.**, which operated all through 1959 without any lost-time accidents. Actually, the zinc-lead producer, located near Salmo, began its accident-free period April 10, 1958, thus operating 392,000 man-hours and 630 calendar days on this basis. The mine, which has several previous safety citations, employs about 120 men, 70 of them working underground. J. C. MacLean is superintendent of the property, and G. W. Law is safety officer.

QUEBEC—Part of the equipment for the \$200,000,000 iron ore project of **The Quebec Cartier Mining Company Ltd.** will be two 84 by 66-inch Superior jaw crushers and two special 30-65 gyratories as secondary crushers. The crushing equipment, made by Allis-Chalmers Manufacturing Company, will be used at the company's Lac Jeannine ore body, one of a number in the area. First production at the deposit is scheduled for January 1961, and about 80,000 tons of ore will be mined and treated per day initially. Quebec Cartier, a subsidiary of **United States Steel Corporation**, started its project last summer. It includes an 8,000,000-ton-per-year concentration plant, a 193-mile railroad that links the mine with port facilities to be built at Shelter Bay on the Gulf of St. Lawrence, and the new mining town of Gagnonville.

BRITISH COLUMBIA—Efficiency studies are reducing operating costs at **Bralorne Pioneer Mines, Ltd.**, British Columbia's largest gold producer, in the Bralorne district. Improvements in mine development, mining practice and accounting control have been made thus far. Exploration and development work continues to provide encouraging results. Production in the last three months of 1959 totaled 34,837 ounces of gold from 53,505 tons of ore milled, Franc R. Joubin is president.



EIRE—St. Patrick Copper Mines Ltd., which operates Eire's largest mine at Avoca, County Wicklow, has been guaranteed a further load of £55,000 from the Eire government, which in 1958 guaranteed loans up to £1,300,000. The new loan will enable St. Patrick, a subsidiary of **Mogul Mining Corporation** of Toronto, Canada, to open up deposits expected to produce 1,000 tons of copper daily. Ore bodies worked since mining began in October 1958 have produced lower grade ore than originally anticipated.

SWEDEN—At the Norberg mines of **Statsgruvor A. B.**, construction of a new headframe and concentration plant have

been completed and ore dressing machinery is being installed. The magnetic content of the ore, about 20 percent, will first be recovered by magnetic separation, and the hematite, about 80 percent, will be floated. The mill's flow sheet was developed during a two-year test period by **Statsgruvor** in **Haksberg**. This is to be the first full-scale flotation plant for hematite in Sweden.

ITALY—An expenditure of 2,500,000,000 lire (\$4,000,000) has been authorized by the Chamber of Deputies for completion and publication of a geological survey of Italy.

YUGOSLAVIA—First tests at **Trepca Mines Ltd.** have shown that one ton of pyrite, containing about 63 percent iron and 33 percent sulphur, can be obtained by magnetic separation from three tons of lead-zinc tailing. The pyrite will be used to make sulphuric acid which in turn will be used to manufacture fertilizers. The Trepca mines are producing about 1,500 tons of tailing daily and in 30 years of operation have stockpiled millions of tons.

HUNGARY—Extensive deposits of bauxite have been discovered in the Nyirad district of western Hungary near mines already being worked. The new deposits, north and northwest of present mines, may provide reserves for about 10 years. The bauxite is located 30 to 40 meters below surface, contained in a bed 12 to 13 meters thick.

SPAIN—An increase of iron ore output to 750,000 tons in 1960, twice that of 1958-1959, is planned by the **Coto Wagner** operation in Leon, where a new aerial tramway from **J. Pohlig A. G.** of Germany, and a new crusher are scheduled for installation. Coto Wagner and other Leon province mines produced 870,000 tons in 1959, while those in Vizcaya produced 1,220,000 tons of the year's total 5,000,000-ton output in Spain. Granada, Santander, and Teruel were other leading iron producing provinces.

ITALY—A symposium on the electrolysis of fused salts and production of special metals will be held in Milan May 5, 6 and 7, sponsored by the Italian Metallurgy Association. Subjects of papers scheduled include theories of aluminum electrolysis, application of the electrolysis processes in metallurgy of titanium and zirconium, and electrolytic production manganese. Among speakers will be Prof. R. Piontelli, Prof. M. Soccil, and Prof. G. Scacciati. Visits to the **Istituto Sperimentale dei Metalli Leggeri** in Novara and to the **Montecatini** aluminum plant in Bolzano are planned.

RUSSIA—Copper ore recently located at the **Gaisk** mine in the Orenburg region of the southern Urals is said to average 10 to 12 percent, and in some places up to 30 percent, in contrast to the usual content of the mines of that area of 1.0 to 1.2 percent Cu. Rapid development is under way at the mine so that copper production in the Urals district plants can be increased considerably. Aluminum production in the U.S.S.R. is also reportedly on the increase, so that the Soviets need for copper from the West will probably diminish.

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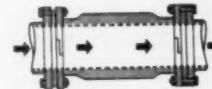
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polychromator, it has three parts: an electrical circuit that provides a controlled discharge to the metals; a unit to spread light from the discharge into a spectrum and select required rays from it; and a third part that measures the intensity of the rays electronically, controls the sequence of operations and presents results. Output of the device is first printed on a paper strip and then converted into amounts of the various constituents of the sample by means of tables or graphs.

SWEDEN — LKAB, Malberget has completed its new iron ore concentration plant in Vitafors that will produce magnetite concentrate and, by flotation, concentrate assaying about 15 percent phosphorous. The new plant is 103 by 85 by 30 meters, with five sections, some of them 22 meters wide. Concentrate is transported to the pelletizing plant or stock pile by conveyor in which the belt is supported by a new type of gallery built by A. B. Vretstorp-verken. This is a round tube of 3.4 meter diameter built with steel plates 8 millimeters thick. Total length is 185 meters, span between each of three pillars is 57 meters, and height over the surface, 30 meters.

RUMANIA — A 27 percent increase in production of iron ore is planned this year, with the output scheduled to be 1,400,000 tons, achieved by enlarging and reconstructing present projects.

GREECE — Kennecott Copper Corporation of the United States has recently completed legal requirements necessary for a mining company in Greece. Previously, Kennecott had exercised its

option to purchase property containing asbestos deposits, after extensive testing and diamond drilling.

BULGARIA — At the new lead mine opened in February by the **Boliden Company** near Vassbo the ore body, PbS in sandstone, lies about 80 meters below surface. The headframe is 78 meters high and located close to the concentration plant. A modification of the room-and-pillar mining method is used.

SWEDEN — Rebuilding of the old Grangseberg iron mine by **Stora Kopparbergs Bergslags** has been completed and production began in January. Output will be 300,000 tons of iron concentrate yearly. A 62-meter headframe, a new compressor plant, workshop and concentration plant have been completed.

GREECE — By a recent agreement, Western Germany will provide credit of £250,000 for the development of mining and metallurgy in Greece, mainly for enlarging the steel industry and increasing manganese production.

BULGARIA — A new copper flotation plant, with a capacity of 350 tons of copper and iron ore daily, has started production near Malko-Travnao, a small town on the border of Bulgaria and Albania.

YUGOSLAVIA — At the Blagojev Kamen gold and tungsten mine, about 60 kilograms of gold and 80 tons of tungsten trioxide concentrate are being extracted yearly, with the concentrate smelted into ferro-tungsten. Prospecting work con-

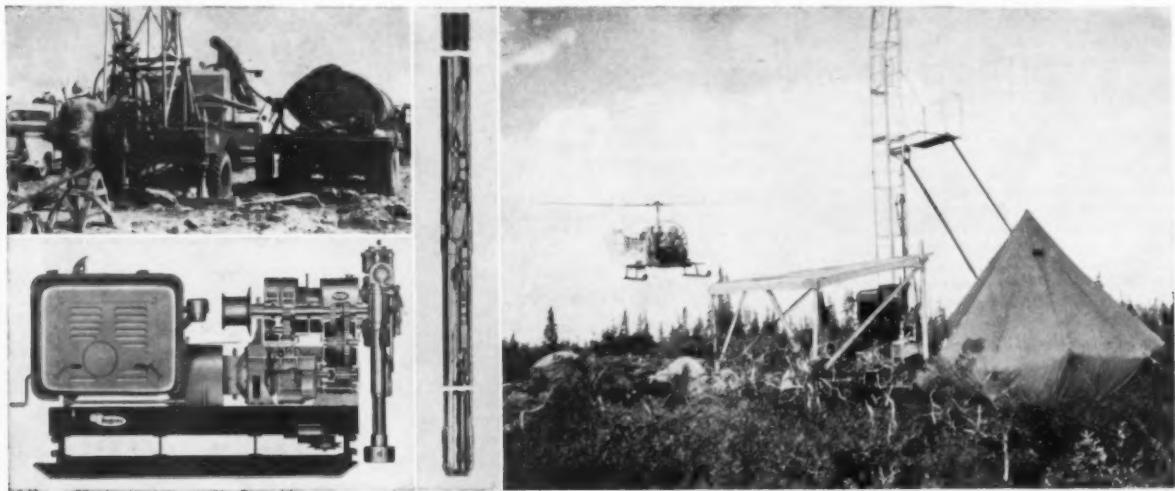
tinues and future plans are for an annual production goal of 300 kilograms gold, 150 tons of ferro-tungsten and 30 tons of tungsten-concentrate.



LATIN AMERICA

CHILE — Official opening of the expanded Huachipato steel mill near Concepcion was held recently. The expansion will increase the capacity of the **Compania de Aceros del Pacifico (CAP)** plant from 430,000 tons to 650,000 tons yearly. A new blast furnace was installed and there are now four Siemens-Martin furnaces at the plant. The plant is presently supplied with iron ore from the **Bethlehem Chile Iron Mines Co.** El-Romeral mine, but in the future the ore will come from the CAP-owned **Algarrobo** mine, in Atacama Province, 10 kilometers from Huasco. Mining from this deposit, containing 68 percent magnetite, is to start this year. Development plans include loading facilities with a mechanized port on Guacolda Island that can handle 1,600 tons an hour, and a 56-kilometer railroad from the mine to the island. The entire project represents an investment of \$20,000,000.

MEXICO — **El Bastan Mining Company** in the vicinity of Huetamo, Michoacan, has cut a new vein in virgin territory. Exploration indicates a favorable outlook. F. Romero is superintendent.



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JAMAICA—An exchange of agricultural goods from the United States for Jamaican bauxite was urged recently by Norman Manley, prime minister of Jamaica. Such a barter program was negotiated last fall by **Reynolds Aluminum Company** with Haitian bauxite producers. Jamaica is now the world's largest producer of bauxite, said Mr. Manley, and exports 4,000,000 tons to the United States each year. Ore deposits are sufficient to keep up this rate for 10 years. Geologists are searching for additional bauxite deposits, but ore bodies recently discovered appear extensive but not as high grade as previous ones. The barter plan, which would aid the island's expanding social program and industrial growth, would supplement present arrangements that Jamaican producers have with Reynolds and with **Kaiser Aluminum and Chemical Corporation**, now supplied with high grade (better than 50 percent alumina) bauxite.

HONDURAS—An extensive trenching program to be followed by several shafts to determine the depth of magnetite deposits has been started by the **Honduras Mining and Development Company** at its claims on Quita Gana Mountain about 104 miles northwest of Tegucigalpa. The company hopes to confirm the existence of large enough tonnages in the three deposits that crop out to warrant railroad construction and port loading facilities. Surface sampling has indicated high grade magnetite. Garrett D. Combs, Dallas, Texas, is company president.

PERU—A \$21,900,000 expansion program to install beneficiation facilities at Marcona Mining Company near Port of San Juan includes a three-mile conveyor, a new pier and crushing and concentrating facilities for iron ore. The program is being financed in part by loans of \$12,000,000 from the Export-Import Bank and private commercial banks in the United States. Marcona is partly owned by **Utah Construction & Mining Co.**, headquartered in San Francisco, California.

MEXICO—A geophysics department for mining investigation has been established by **Consejo de Recursos No Renovables**.

CHILE—A copper smelter and refinery at the Port of Chanaral will be built by **Anaconda Company**, which recently held an official opening ceremony at its big new El Salvador copper mine. The smelter, scheduled to be started the middle of this year, will include an electrolytic refinery for treating blister produced at El Salvador as well as that from smaller mines in the region.

PERU—**Cia. Cuprifica ICA** has started production at its Canza copper mine group, with ore assaying 6 to 8 percent copper. Studies for a power plant have been completed for the lead-silver mine of **Cia. Minera Pacaraos**. The company has also made a survey for a seven-kilometer road to the mine.

CHILE—The Chilean Mining Bank, **Caja de Credito y Fomento Minero**, will spend 1,330,950 Escudos during 1960 in a program to aid small and medium-sized mining enterprises in northern Chile. (In the new currency one Escudo equals \$1.00, United States). The initial assistance will go to **Elisa de Bordos** for a mill, a copper concentration plant in the Illapel district, the **Osvaldo Martinez**

mill in Salado, **Pedro Aguirre Cerda** copper concentration plant, and the **Domeyco** mill.

VENEZUELA—Negotiations for building an aluminum reduction plant are under way between the Venezuelan government and **Reynolds International, Inc.**, subsidiary of **Reynolds Metals Company** with headquarters in Hamilton, Bermuda. Tentative site of the proposed plant is in the Guayana region, which is seen by Reynolds to have great industrial possibilities. The project involves importing bauxite and reducing it to pure aluminum with power from the government's hydroelectric plant being constructed on the Caroni River.



PAKISTAN—Magnetite and hematite deposits have been discovered in northwest and western West Pakistan. Results of a mineral survey in that area were disclosed at a symposium of the Pakistan Science Conference in Hyderabad recently. According to the report, deposits of most of the northwestern regions of Mohmand and Khyber agencies, and "gali" in Hazara-Muree ranges were fairly rich, but would be difficult to transport. However, deposits at Kalabagh do not present many transportation problems.

REPUBLIC OF KOREA—The Geological Survey of Korea has recommended that a secondary aerial survey for mineral prospecting be made with a special United Nations Fund of \$500,000. Present plans involve extension of prospecting to include magnetite and other metallic minerals along Korea's east shore and through the Honam area in the southwest part of the country.

INDIA—Following approval of a \$13,600,000 Export-Import Bank loan, the **Hindustan Aluminium Corporation Ltd.** is preparing to start construction of an aluminum reduction plant in Utar Prad-

esh state. It will be located near the Rihand Dam, close to extensive bauxite deposits. Hindustan Aluminium is a joint undertaking of the **Birla** interests in India and the **Kaiser Aluminum and Chemical Corporation** of the United States, which will train technical employees and provide technological assistance to the Indian firm after production begins. The plant will comprise an alumina installation and 20,000-metric-ton reduction unit. Several thousand Indian nationals will be employed in construction of the plant, scheduled to be in operation in 1962. Total cost of the project will be over \$30,000,000.

BURMA—Total ore mined by **Burma Corp. (1951) Ltd.** since rehabilitation of the **Bawdin** mines in the northern Shan states after World War II is 556,651 tons, contained 20.7 percent lead; 12.6 zinc; 1.00 copper, and 15.7 ounces of silver per ton. Metal recovery at the corporation's mill in that period was 83 percent Pb, and 72 percent Zn, while at the smelter it was about 97 percent Pb. Total metal recovery for lead and zinc combined was about 58 percent. Total ore mined since the mine was first developed at the end of the last century is about 9,595,804 tons assaying 21.5 percent lead.

JAPAN—Alumina output for 1960 will be increased by about 100,000 short tons to reach 450,000 short tons (490,000 metric tons) for the fiscal year starting in April. Of that total, **Nippon Light Metal Company** will produce about 185,200 metric tons; **Sumitomo Chemical Company**, 120,200, and **Showa Denko Co. Ltd.**, 104,000 metric tons. In the last 18 months aluminum consumption in Japan has increased sharply. Exports to the United States are currently about 110,000 annual short tons.

HONG KONG—Plans for construction of a steel mill on an island west of the Kowloon Peninsula are being made by **Fuji Iron and Steel Company**, major Japanese steel producer, and a Chinese investor. Modern steel processing facilities, including rolling mills and two 10-ton electric furnaces, will be imported from Japan for the new plant, scheduled to be started in August. Iron from scrapped ships will be used to produce

New Road for Brokopondo Aluminum Project

This 50-mile road (dotted line) under construction along the Suriname River will connect the bauxite mining village of Paranam with the 150,000-kilowatt hydroelectric dam to be built at Affobakka. Part of the Brokopondo Development in which the Suriname government and Suriname Aluminum Company (Suralco) are associated, the \$1,500,000 project will make Suriname (formerly Dutch Guiana) the fourth aluminum-producing country in the Western Hemisphere. A 60,000-ton aluminum smelter, and an alumina plant are other phases of the five-year project. Construction camps have been built at Krakka, Berg En Dal, and Affobakka for the nearly 1,000 workers engaged in road construction. Heavily shaded area on the map shows where an inland lake will be created above the dam, which will be started late this summer. Suralco is a subsidiary of Aluminum Company of America, which began its bauxite explorations here in 1915.



steel, chiefly for building purposes. The new steel-producing firm, to be called the **Hong Kong Metal Industry Co.**, will probably be headed by Weng Shao-Huan of Hong Kong, with Fuji executives as vice presidents.

MALAYA—Net profit of **Pacific Tin Consolidated Corporation** increased during the last quarter of 1959 with sales of 856,134 pounds of metallic tin at an average price of \$0.96 per pound. Operating revenue from feldspar (mined in the United States) and byproducts was \$580,000. During the entire year 2,157,169 pounds of metallic tin were sold.

CHINA—Fair quantities of Chinese antimony, in grade equal to European metal and costing about one-third less, are being purchased by Canadian consumers. China has steadily regained its former position as the world's largest antimony producer, with an output of about 16,500 tons in 1958. During the five-year period of 1949 to 1953 average output per year was 7,700 tons, rising to an average of 14,200 tons annually during the next five-year period. Canada also produces antimony, but not enough for its own needs. A long strike at Belgian smelters has tightened the supply from Europe. Price of the Chinese metal is about \$0.1950 a pound, around \$0.06 less than New York consumers pay for antimony from Europe.

TURKEY—An iron ore district about 80 kilometers north of Malatya in east central Turkey now under development has several siderite ore bodies with a capping of hematite. Other ore bodies in

the area are mainly magnetite. Reserves of about 40,000,000 tons are estimated for the district. Two other iron deposits, one south of Ankara, and the other south of Kayseri, have been developed in recent years but are small-scale producers because of inadequate finances. Both have high-grade ore and large proven reserves.

PAKISTAN—In Azad Kashmir, where several mineral deposits have been discovered by the Geological Survey, the government has granted licenses for mineral exploration to several firms, including **Gilani and Company Ltd.**, **Associated Minerals Corporation, Ltd.**, **Baluchistan Coal Company Ltd.** and **Hasan Ali Hirani of Karachi**. Soapstone, mica, bauxite, and coal have been discovered in the area.



UNION OF SOUTH AFRICA—Indications are that a mine will be developed in the area held by **Western Holdings Ltd.** just south of the Vaal Reefs mine. It will be operated by **Union Corporation**, as previously agreed. Results are expected soon from two of three check drill holes. However, great importance is also seen in the area to the east, where **Rand Mines Ltd.** and some of **Freddie's** interests are jointly drilling a hole. It is

also thought that perhaps the synclinal formation from west to east in this area persists southwards and there may be an upthrow of the reef to reasonable depth south of the Vaal river. In the western sub-outcrop zone of the currently productive **Western Holdings** mine to the south, another hole, drilled primarily for geological information, yielded values of 542-inch-dwts., at 3,059 feet. This, together with other recent results from the sub-outcrop zone, indicates that fluctuations should be expected from what appears to be a satisfactorily high average. There are also indications that in the northwestern section the sub-outcrop may lie further west than previously expected. **Free State Geduld Ltd.** is testing this in its leased area.

UNITED ARAB REPUBLIC—The **Sinai Manganese Company** will increase production to 200,000 tons run-of-mine manganese ore this year. Orders for new equipment, including three Holman Rotair compressors, to implement the expansion have been placed with British companies. **Fergusson, Wild and Company Ltd.** is advising on the production step-up.

UNION OF SOUTH AFRICA—A Philips cascade electron accelerator/generator has been installed at the Diamond Research Laboratory in Johannesburg to alter certain physical characteristics of diamonds—such as color, surface structure, hardness, and electrical conductivity. The equipment will facilitate research into characteristics of various changes in diamonds effected by high speed electrons and/or gamma rays and

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FEDERATION OF RHODESIA & NYASALAND—Difficulties have been encountered by Falcon Mines Ltd. in bringing its Dalny gold mine in Southern Rhodesia to successful production. The company is now starting a further development and exploration program along the 4½-mile reef strike at that property.

ALGERIA—Ore reserves of Societe Algerienne du Zinc (ALZI) partly owned by Newmont Mining Corporation, are sufficient for about three more years of full-scale operation. Six diamond drill holes, located about 4,000 feet north of the ore body now being mined, were completed during last year and indicated presence of mineralization. Drilling is being continued.

UNION OF SOUTH AFRICA—Pala-bora Mining Company completed 89 diamond drill holes on its optioned and leased copper property last year, confirming existence of a low-grade ore body suitable for open-pit mining. Further development plans may include a pilot mill campaign to establish the best metallurgical treatment of the ore.

MOROCCO—Exploration work in the Alhucemas region of northern Morocco will be undertaken by Societe Nord-Africaine du Plomb (NAP) through a controlling interest it has acquired in a new Moroccan company. NAP, is 31.8 percent owned by Newmont Mining Corporation.

NIGERIA—Tin and Associated Minerals Ltd. shipped 760,000 pounds of columbite concentrate during 1959, compared with 250,000 in 1958 and 660,000 in 1957. Shipments of a byproduct, tin concentrate, also increased, to 275,000 pounds. Another byproduct, high-hafnium zircon, totalling 2,500,000 pounds which had been stockpiled, was shipped for use in nuclear reactors. Kennecott-Copper Corporation has increased its holdings in this company from 52 to 76 percent.

UNION OF SOUTH AFRICA—O'okiep Copper Company Ltd. milled 1,689,100 tons averaging 2.46 percent copper in 1959. Sulphide ore reserves last June were 27,820,000 tons averaging 2.19 percent copper. To replace decreasing output of older mines in the O'okiep area, the company will prepare the Carolsberg ore body for production at a monthly rate of 75,000 tons. Shaft sinking has begun and production is scheduled for 1963. Capital cost of this project will be about \$6,000,000.

SOUTH WEST AFRICA—Ore milled by Tsumeb Corporation Ltd. in the calendar year 1959 totaled 625,534 tons, averaging 6.13 percent copper, 12.43 percent lead, and 5.13 percent zinc, figures slightly lower than the previous year. Underground shaft sinking from the 30th level to develop the ore body below that level is in progress. The company will build a copper smelter, to start

production in 1962 at the rate of 20,000 short tons of blister copper per year. Additional production of germanium by-product may also result from construction of the smelter. Exploration rights for a new copper prospect on Klein Aub farm, about 300 miles south of Tsumeb, have been secured by the company, which will have two-thirds interest in the properties if options to purchase are exercised. Tsumeb Corporation is also continuing its exploration at Asis, 30 miles west of Tsumeb, with encouraging results.

UNION OF SOUTH AFRICA—President Steyn Gold Mining Company Ltd.

expects to have its No. 3 shaft system in the southwestern section ready for ore-hoisting by the end of 1961, methane gas and water notwithstanding. In its ventilation component of the No. 3 shaft system, the company achieved a new world sinking record of 1,020 feet in January, topping by 19 feet the record set last November by the same mine in the No. 3 hoisting component. (see MINING WORLD, March 1960, page 77). The lined diameters of the ventilation and main components are 20 and 26 feet, respectively. Both will be sunk to about 6,300 feet in a zone which may turn out to be relatively high grade. In the main component a double-drum hoist was used, while in the ventilation

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FEDERATION OF RHODESIA & NYASALAND—Annual metal output of the Rhodesian Broken Hill Development Company Ltd. will be nearly doubled when the new blast-furnace process is in full operation (see MINING WORLD, March 1960, page 42). Expected production when the expansion program is completed will be 28,000 long tons of lead and 55,000 long tons of zinc, compared to the present average annual figures of 14,400 and 30,000, respectively. Some £400,000 has already been spent on the £4,000,000 project, mainly to secure rights to, and designs of, the process (See MINING WORLD, October 1957, page 58). Further plans call for installation of a third generator at the Lunsemfwa hydroelectric site at a cost of about £350,000.

REPUBLIC OF GUINEA—Plans to mine the Boke bauxite deposit, which has a potential of 1,500,000 tons annually, have been made by la Societe des Bauxites du Midi and l'Aluminium Limited. The operators expect to export 1,000,000 tons a year, with the remaining 500,000 tons treated on the spot to produce 220,000 tons of alumina. Investment of more than 40,000,000 francs will cover equipment for an open pit mine and construction of a plant. Railway facilities, including a bridge, will be built as well as dock facilities at Port-Kabenke at the mouth of the Nunez.

SOUTHWEST AFRICA—Financing plans are being made by Industrial

Diamonds of South Africa (1945) Ltd. for £150,000 to purchase a cutter-head dredge and provide working capital to mine a 12-mile long disseminated terrace. A survey indicates yields of about 7.1 carats per 100 cubic yards. Estimated reserve in the deposits has been given as 4,000,000 carats.

FEDERATION OF RHODESIA & NYASALAND—Brancroft Mines Ltd. is preparing to open its Konkola ore body located about seven miles from the main center of operation. Active production is expected about mid-year.

GHANA—A shaft-sinking program and deep level development will be undertaken by Ariston Gold Mines (1929) Ltd., in an effort to prevent a drop in reserve tonnage. A recent assessment of proven ore reserves shows that the mill can be kept going for about five years.

UNION OF SOUTH AFRICA—Benefits of centralized research in metallurgical problems reported recently by the Anglo-Transvaal group cover use of the "reverse leach" process at the Hartebeestfontein Gold Mining Company Ltd. mine where uranium extraction is followed by gold recovery, with improved yields in both cases. At the Virginia Orange Free State Gold Mining Company Ltd. mine, the "hot ferric leach" has improved uranium yield. The central laboratory has also evolved a process of economical concentration of nickel from ore of the group's Southern Rhodesia deposit.

BELGIAN CONGO—Copper output by the Union Minière du Haut Katanga

in 1959 was some 280,000 metric tons, exceeding both the company's goal of 260,000 tons and the previous record of 247,453 tons in 1956. Cobalt consumption has shown an improvement in the last year, so that production was raised to 8,500 tons, compared with 6,500 tons the year before. Output of uranium, radium, silver, cadmium, germanium, and zinc concentrate remained at about the same level as previous years. Deliveries of uranium were down, however, and government purchase contracts will run out in 1960. Germanium sales improved, and exports of zinc concentrate increased.

UNITED ARAB REPUBLIC—Three mineral deposits in Egypt will be explored by Demag Company of West Germany. First area is a manganese ore deposit near Bogma in the Sinai Peninsula, while the other two are ilmenite deposits, one near Abughalga, 25 kilometers from the Red Sea, and the second in the eastern desert near Hamash. Transport possibilities, processing, and marketing problems will be studied by the German engineering firm, which will also advise on production of titanium from the ilmenite deposits.

CAMEROON—Cameroon Mines recently discovered a bauxite deposit with reserves estimated at 500,000,000 tons. Location of the deposit is in the Province of Adamaua, Northern Cameroons, in the region of the Tchabes, Assom Lake, Partap and N'Gaoundal. Exact percentage of the bauxite has not been determined. Although the area is over 500 kilometers from a sea port, the projected Douala-Tehad railway could be used.

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REPUBLIC OF THE PHILIPPINES—Newmont Mining Corporation reports that ore-grade mineralization was discovered during its exploration program at the properties of Atlas Consolidated Mining and Development Corporation on the island of Cebu. The mineralization is being further outlined by diamond drilling near the Toledo open-pit mine currently under production.

NEW SOUTH WALES—Full-time mining operations have been resumed by silver-lead-zinc companies at Broken Hill following the recent decision of the United Nations Lead-Zinc Committee that voluntary cutbacks in supplies of zinc to world markets are no longer necessary. Restrictions on lead are still in force. Output of lead concentrates in excess of permitted quotas will be stockpiled at Port Pirie in Southern Australia.

TASMANIA—Mount Lyell Mining and Railway Company Ltd., which is currently raising its capital to £A4,068,750, is increasing its output and milled 500,681 tons in the three months ended December 31, compared with 471,000 tons in the same period the previous year. Recoverable copper produced in that period was 3,022 tons, and a total of 11,000 tons is expected for the year. The open-pit mine on the west coast of Tasmania has reserves of over 38,000,000 tons, sufficient for 20 years' operation at the current output rate. During the next two years, some 200,000,000 tons of rock and overburden must be removed. The company recently acquired nearly 50 percent of Renison Associated Tin Mines N. L. which is being reorganized for greater output, and has joined with E. Z. Industries to prospect an area in the Moore Valley.

SOUTH AUSTRALIA—Greater activity by the Broken Hill Associated Smelters Pty. Ltd. will follow the production step-up at Broken Hill mines. Last year's output of 189,000 tons of market lead was below the previous year's figure and considerably below plant capacity. Continued firmness in zinc prices has reportedly reawakened interest in smelting steel-tilled slag for zinc recovery, but it is likely that operations of the Cockle Creek, New South Wales plant of Consolidated Zinc Corporation Ltd. will be thoroughly studied before a decision is made.

NEW GUINEA—The Lakekamu Valley Goldfield will be investigated by Bulolo Gold Dredging Co. Ltd., which is bringing drilling equipment by air to a newly-opened airstrip. This Papuan valley was worked superficially before World War II and about 40,000 ounces of gold were recovered. The gold field was actually discovered and worked in a small way at an earlier period, and deeper gold is considered probable.

REPUBLIC OF THE PHILIPPINES—Marinduque Iron Mines produced Pesos 1,372,262 worth of ores and shipped Pesos 1,267,879 worth during December. A total of 502 wet metric tons of straight shipping copper ore, containing about

140,395 pounds of copper valued at about Pesos 89,770 were mined at Bagacay, Samar, and delivered to loading point. The mill at Bagacay treated 5,560 dry metric tons of milling grade copper ore, containing an estimated 396,849 pounds of copper valued at about Pesos 243,903, although there was a complete shutdown for three weeks because of typhoon damage. At Sipalay, Occidental Negros, 12,779 dry metric tons of ore were milled, for production of 2,851 tons of copper concentrates with an approximate value of Pesos 980,819. Production of molybdenum at Sipalay, which began only last year, totalled 14.1 wet metric tons of concentrates valued at about Pesos 35,851. Molybdenum shipment to Japan was 24.2 wet metric tons. Iron ore totalling 1,178 wet metric tons and valued at Pesos 22,117 was produced at Taluntunan, Marinduque, but there were no shipments from this property.

NEW ZEALAND—Record yields of gold are being produced by the West Coast operations of Arabura Gold Dredging Ltd. and Kanieri Gold Dredging Ltd. Recent monthly returns have been over 2,000 ounces of bullion from treating about 300,000 cubic yards. The two dredges are said to be among the world's most economical, costs are about sixpence (sterling) per yard. Near Thames and Waibi small amounts of gold concentrates are being produced from old workings and tailings. The outcome of drilling near Thames for unknown ore bodies is watched with interest.

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Euclid 49 FD 6129	15 tons	Houston, Pa.	1947
Euclid 49 FD 6395	15 tons	Houston, Pa.	1947
Euclid 49 FD 8984	Water Wagon	Indianapolis, Ind.	1947
Euclid 49 FD 7761	15 tons	Indianapolis, Ind.	1948
Euclid 49 FD 8179	15 tons	Indianapolis, Ind.	1948
Euclid 49 FD 6753	15 tons	Indianapolis, Ind.	1947
Euclid 49 FD 7471	15 tons	Indianapolis, Ind.	1948
Euclid 49 FD 10108	15 tons	Indianapolis, Ind.	1951
Euclid 20 TD 10583	22½ tons	Besse, Idaho	1950
Euclid 20 TD 10591	22½ tons	Besse, Idaho	1950
Euclid 20 TD 10630	22½ tons	Besse, Idaho	1950
Euclid 20 TD 10637	22½ tons	Besse, Idaho	1950
Euclid 20 TD 10581	22½ tons	Besse, Idaho	1950
Euclid 32 TD 11475	22½ tons	Besse, Idaho	1951
Euclid 20 TD 10582	22½ tons	Coeur d' Alene, Idaho	1950
Euclid 20 TD 10836	22½ tons	Coeur d' Alene, Idaho	1950
Euclid 20 TD 10588	22½ tons	Coeur d' Alene, Idaho	1950
Euclid 20 TD 10835	22½ tons	Coeur d' Alene, Idaho	1950
Euclid 20 TD 10589	22½ tons	Birmingham, Alabama	1950
Euclid 20 TD 10828	22½ tons	Birmingham, Alabama	1950
Euclid 20 TD 10831	22½ tons	Birmingham, Alabama	1950
Dort 10SUG57037	10 ton Underground	Worcester, Mass.	1957
Dort 10SUG57038	10 ton Underground	Worcester, Mass.	1957
Dort 10SUG57051	10 ton Underground	Worcester, Mass.	1957
Dort 10SUG57052	10 ton Underground	Worcester, Mass.	1957
Mack LRIS 10990	15 ton	Providence, R.I.	1950
Mack LRIS 1159D	15 ton	Providence, R.I.	1950
Mack LRIS 1185D	15 ton	Providence, R.I.	1951
Mack LRIS 1186D	15 ton	Providence, R.I.	1951
Mack LRIS 1053D	15 ton	Indianapolis, Ind.	1949
Mack LRV2D 1242D	34 ton	Hibbing, Minn.	1952
Mack LRV2D 1243D	34 ton	Hibbing, Minn.	1952
Mack LRV2D 1244D	34 ton	Hibbing, Minn.	1952
Mack LRV2D 1245D	34 ton	Hibbing, Minn.	1952
Mack LRV2D 1247D	34 ton	Hibbing, Minn.	1952
Mack LRV2D 1248D	34 ton	Hibbing, Minn.	1952
Mack LRV2D 1249D	34 ton	Hibbing, Minn.	1953
Mack LRV2D 1250D	34 ton	Hibbing, Minn.	1953
Mack LRV2D 1297D	34 ton	Hibbing, Minn.	1953
Mack LRV2D 1300D	34 ton	Hibbing, Minn.	1953
Mack LRV2D 1302D	34 ton	Hibbing, Minn.	1953
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1—42" x 125' Link Belt, conveyor steel frame 30' sections, 2-100 HP West. conveyor motor 440 Volt

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1—36" x 64' Link Belt conveyor steel frame 2-100 HP West. gearmotor, 440 Volt



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2—8" Dorco diaphragm, type W, 5 HP TEFC motor

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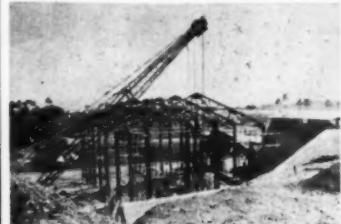
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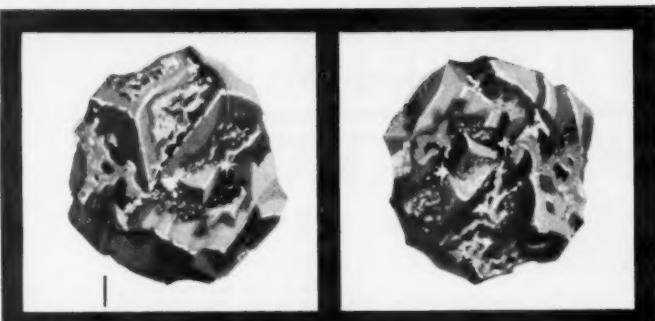
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Triple Roll: Pioneer 30x18 crusher.
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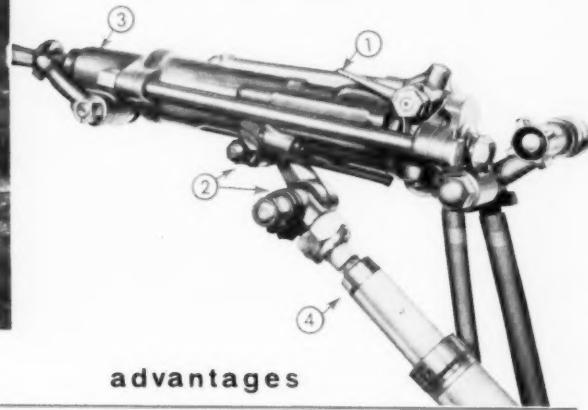
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features

advantages

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All drilling functions are on one convenient control — blowing, feeding, collaring, drilling. In feeding position, feed-leg pressure is adjusted by a roll-type valve on drill handle.

**2 INTEGRAL FEED LEG WITH
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Only one air hose connection needed — air from drill casing passes to the leg through built-in connection. Tension on knee joint and balance of drill on leg both adjustable to suit operator's preference.

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